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# The Enhancement of Student's Teacher Mathematical Reasoning Ability through Reflective Learning

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**Abstract**
This study aims to examine the enhancement of mathematical reasoning ability through reflective learning. This study used quasi-experimental method with nonequivalent pretest and posttest control group design. The subject of this study were students of Mathematics Education Program in one of private universities in Palembang, South Sumatera, Indonesia, consisting of 155 students. Subject of study are differentiated into two groups namely experimental group who were taught by reflective learning (RL) and control group who were taught by conventional learning (CL). This study was conducted in odd semester academic year of 2013/2014. Instrument in this study are mathematical reasoning ability test, observation sheet, and interview guide. By using Mann-Whitney test, it is concluded that achievement and enhancement of mathematical reasoning ability of student teachers who received RL is better than student teachers who received CL.
**Key words:** mathematical reasoning ability, reflective learning

## 1. Introduction

Mathematics is knowledge loaded with materials which can trigger the development of thinking ability particularly reasoning ability. This is because mathematics is knowledge which has deductive axiomatic characteristic, which need thinking ability and reasoning to understand it. As suggested by Tinggih (in Suherman and Winataputra, 1992) that mathematics is knowledge obtained by reasoning. This statement is confirmed by Ansjar and Sembiring (2000), that reasoning is main characteristic of mathematics which cannot be separated from activity of learning and developing mathematics or solve the mathematical problem. Beside, Wahyudin (2008:35-36) stated that reasoning ability is very important to understand mathematics and mathematically reasoning is thinking habit. This result of reasoning then poured into systematical concepts in mathematics. Those concepts continually developed to become concepts which more complex and advance even can be used to solve various problems in life.

This reasoning ability is useful for someone in process of building and comparing ideas from various situations faced, so he/she can take appropriate decision in solving the problem of life. Such as suggested by Wahyudin (2008: 520), reasoning offer strong ways to build and express ideas about various phenomena. The higher of education level someone has, then the higher of difficulty level of his/her mathematics learning. Learning mathematics in higher education generally involve higher level cognitive ability, such as analytic, synthesis, and evaluation, not only memorize factual knowledge or simple application of various formulation or principle.

Committee on the Undergraduate Program in Mathematics (CUPM) (MAA, 2004) give six basic recommendations for department, program and all courses in mathematics. One recommendations explain that each course in mathematics should be activity which will help students to develop analytical ability, critical reasoning, problem solving and communication ability. Based on that recommendation of CUPM, it is clear that reasoning ability is the matters which should be noticed in mathematics teaching particularly in higher education, of course without ruling out another abilities.

Romberg & Carpenter (in Senger, 1999) place responsibility of reformation success in mathematics education on teacher shoulder. One of reformation which is intended is related with approach or learning model which is used in mathematics learning. Bearing in mind the characteristic of mathematics which has abstract inquiry and deductive axiomatic, of course it is not easy thing for a student teacher to teach mathematics to his/her students later. Therefore, an approach or learning model is needed which is capable to accommodate mathematical thinking ability of student teacher particularly mathematical reasoning ability. This is intended that student teacher is trained to solve various problems in teaching learning process in class later.

The problem faced by teacher in learning in class demand teachers always to think, give serious attention, deep consideration about event or decision they take. In making justification about decision, teachers should not rely on instinct or technique which has been determined, in contrary teachers need to think what is prevailed; what choice available, and another questions which are related critically and analytically (Norlander-Case in Hussin & Saleh, 2009). This situation in parallel with definition of reflective thinking according to Dewey (in Hussin & Saleh, 2009) that is "turning a subject over in the mind and giving it serious and consecutive consideration". In

 

context of this study, reflection means thinking and reviewing ideas, treatment, and situation in teaching learning process before next action is taken.

Reflective learning is learning by involving reflective thinking activity in its process. Reflection in learning context is formulated by Boud, et al. (in Sirajuddin, 2009; Kurnia, 2006) as "a generic for those intellectual and affective activities in which individuals engage to explore their experiences in order to lean a new understanding and appreciations". When reflective thinking is going on in learner, he/she learn what she/he face, gives assumption, judges, behaves and applies his/her understanding. It is very good because if this going on continually then finally this thinking activity will arrive in deeper understanding, thinking change, and finally solve the problem. Hmelo & Ferrari (in Song, Koszalka and Grabowski, 2005) concluded further that reflection help student/college student to build higher order thinking skill.

According to Insuasty and Castillo (2010), reflection should become underlying part for teacher development because teachers has obligation to be able to evaluate and rearrange their teaching skill in order to optimize teaching learning process. A reflective teacher also required to be able to has critical attitude toward his/her own teaching ability in order that student can obtain learning experience which is dynamical, valuable and meaningful for their life. Further, Zeichner and Liston (in Radulescu, 2013) stated that reflective learning concept as means to develop teacher's professional ability. This because reflective learning concept consist of some processes which in generally aim to grow exploration attitude and investigation in order to arouse teacher student's awareness and become factor which influence student teacher's learning process.

Guided by background which is stated earlier, the general problem in this study is: "Is reflective learning enable to enhance mathematical reasoning ability of student teachers?" This general problem is elaborated into research question namely: "Is achievement and enhancement of mathematical reasoning ability of student teachers who learn by using reflective learning better than student teachers who learn by using conventional learning?".

As for the aim of this study was to examine comprehensively achievement and enhancement of student teacher's mathematical reasoning ability after getting reflective learning and conventional learning.

## 2. Theoretical Study

### 2.1 Mathematical Reasoning Ability

Reasoning ability can be developed through mathematics learning. Mathematical reasoning ability is ability to understand mathematical ideas deeper, observe data and delve implicit ideas, arrange conjecture, analogy and generalization, reasoning logically. Baroody (1993:2-59) revealed that there are four reasons why reasoning is important for mathematics and daily life, namely:

a. The need of reasoning to do mathematics. It means that reasoning has important role in mathematics development and application.
b. The need of reasoning in school mathematics. This is seen clearly that to master mathematics knowledge appropriately, it need reasoning in mathematics learning.
c. Reasoning involved in other content area. It means that reasoning skills can be applied to another knowledge. It can be said that reasoning support the development of another knowledge.
d. The need of reasoning for everyday life. It means that reasoning is useful to daily life. It means that reasoning is useful to overcome the problem in daily life.

Mathematical reasoning is process to draw conclusion about some ideas based on facts available through logical and critical thinking in solving mathematical problems. In NCTM (2000) mathematical reasoning become one of ability which is hoped to possessed by learner in learning mathematics and foundation in understanding and doing mathematics. Mathematical reasoning occur when learner: 1) observe pattern or regularity, 2) formulate generalization and conjecture related with regularity observed, 3) assess/test the conjecture; 4) construct and assess mathematical argument, and 5) describe (validate) logical conclusion about some ideas and its relatedness (NCTM, 2000).

Thus, developing reasoning ability in mathematics learning become important because will give effect in mapping reasoning of learner particularly when at the time of making decision when solving the problem. Shadiq (2007) argue that art of reasoning is needed in each facet of life in order that each citizen being able to show and analyze the problem clearly, being able to solve the problem appropriately, and being able to judge something critically and objectively, and being able to suggest opinion or idea logically. As for mathematical reasoning ability in this study is student teacher's ability in: (1) interpret a problem based on mathematical concept related; (2) observe relation from information given and being able to solve the problem; (3) draw

 

analogy from similar problem; (4) analyze and make generalization from problem given, and (5) make decision and test the correctness of formulation/answer obtained.

2.2 Reflective Learning

In education field, reflective learning has been developed by many educationists so there are many variations of reflective learning available to us. As revealed by Poblete (1999) that today it is very hard for us to be able to acquire clarity of appropriate definition about reflective teaching because there are so many perspectives and conceptualizations about reflective teaching which is offered by many different authors.

One of reflective learning model is formulated by The International Commission on the Apostolate of Jesuit Education (ICAJE) namely Ignatian Pedagogical Paradigm (Sirajuddin, 2009:195). This Ignatian Pedagogical Paradigm (IPP) had been applied to Ordo Jesuit schools in a whole worlds. According to Drost (in Sirajuddin, 2009), reflective thinking concept through reflective learning is core of IPP. IPP consist of three main elements, namely: experience, reflection, and action, as can be seen from the figure below.

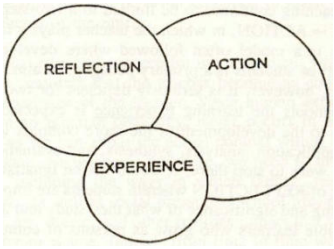


Figure 1
Ignatian Paradigm
(Source: ICAJE, 1993:11)

In order that three elements can be applied well then pre-learning element is needed namely context and post-learning element namely evaluation. So, in its complete application, IPP is applied systematically through five steps of reflective learning, namely: 1) context; 2) experience; 3) reflection; 4) action; and 5) evaluation.

The introduction of **context** can be done by lecturers in the time of apperception, by connecting the material learned with real world situation, and force students to make connection between knowledge owned with its application in daily life. The presentation of **experience** and **reflection** among other can be done in group discussion and presentation**.** In this step, teacher ask reflection questions to train student sensitivity toward implication of material which is being learned. **Action** is the growth of attitude and action showed by students based on experience which has been reflected. **Evaluation** in reflective learning is used as means to reflect student's learning outcome. Evaluation not only in the form of test or exam but it is need to be done also by giving reflective journal to students to record and comment on their experience in learning.

## 3. Research Methodology

This study is experiment study with Quasi-Experimental type (Ruseffendi, 2005; Sugiyono, 2009; Sukmadinata, 2008). Experiment design used is Nonequivalent Pre-Test and Post-Test Control Group Design (Creswell, 2012; Sugiyono, 2009). In short, this experiment design can be described as follow:

$$\begin{array}{ccc} O & X & O \\ \hline O & & O \end{array}$$

Annotation:

$O$ : Initial data/final data of Mathematical Reasoning Ability (MRA)
$X$ : Reflective Learning

Subject of this study are undergraduate students of odd semester, academic year of 2013/2014 in Mathematics Education Study Program, FKIP in one of private universities in Palembang City, South Sumatera, Indonesia. Total of 155 students become subject of study and consist of 4 parallel classes. Two classes as experiment class (79 persons), whereas another two classes as control class (76 persons). Before study was conducted, the equivalence of four classes are tested before. The selection of experiment class and control class is done in class randomization.

 

Instrument of MRA test which is used had been tested in its validity, reliability, differentiability, and level of difficulty. Test item is asserted has met the characteristic which is adequate to be used in study.

## 4. Result of Study and Discussion

### 4.1 Result of Data Analysis

Data of MRA is collected and analyzed to find out student's MRA before and after giving the treatment. To find out description of student's MRA quality, data is analyzed descriptively in order to find out average and standard deviation of pretest, posttest and n-gain scores of student's MRA. Data descriptive statistic of student's MRA completely is presented in Table 1 below.

Table 1
Data descriptive statistic of MRA

| Learning | *n* | Pretest | | Posttest | | N-Gain | | Category of N-Gain |
|---|---|---|---|---|---|---|---|---|
| | | $\bar{x}$ | *s* | $\bar{x}$ | *s* | $\bar{x}$ | *s* | |
| RL | 79 | 7,14 | 2,19 | 29,58 | 7,91 | 0,55 | 0,18 | Medium |
| CL | 76 | 7,12 | 1,83 | 20,89 | 9,07 | 0,34 | 0,22 | Medium |

Annotation: Ideal maximal score 48

Based on Table 1, it is appeared that average of MRA achievement and enhancement of students who learn by reflective learning (RL) is higher than students who learn by conventional learning (CL). Next, data analysis of MRA pretest is done to find out that before giving different learning treatment, those two groups (experiment and control) have similar or different MRA. Following is summary of data statistic test result of MRA pretest.

Table 2
Summary of Data Statistic Test of MRA Pretest

| Learning | *n* | Pretest | | Normality Test | Average of Difference Test | Interpretation |
|---|---|---|---|---|---|---|
| | | $\bar{x}$ | *s* | | | |
| RL | 79 | 7,14 | 2,19 | Not normal distributed | $H_0$ is accepted | There is no difference |
| CL | 76 | 7,12 | 1,83 | Not normal distributed | | |

Annotation : $\alpha = 0{,}05$

From Table 2, it is known that MRA pretest data is not normal distributed, so continued by nonparametric statistic test namely Mann-Whitney test. The result show that null hypothesis is accepted. It means that, there is no significant difference between average of MRA pretest data of students who learn by using RL and students who learn by using CL. This result give conclusion that before giving different treatment between experiment class who get RL and control class who get CL, those two group of students have MRA which is relatively the same in significance degree $\alpha = 0.05$.

Table 3
Summary of Data Statistic Test of MRA Posttest

| Learning | *n* | Posttest | | Normality Test | Average of Difference Test | Interpretation |
|---|---|---|---|---|---|---|
| | | $\bar{x}$ | *s* | | | |
| RL | 79 | 29,58 | 7,91 | Not normal distributed | $H_0$ is rejected | There is difference |
| CL | 76 | 20,89 | 9,07 | Not normal distributed | | |

Annotation: $\alpha = 0{,}05$

Result of Mann-Whitney U test in Table 3 above show that there is significant difference between average of MRA achievement data of students who got RL and students who got CL. By noticing result of data descriptive calculation of MRA achievement in Table 1 which show average of MRA achievement of students who got RL is higher than students who got CL, it can be concluded that MRA achievement of students who got RL is better than students who got RL.

Table 4
Summary of Data Statistic Test of MRA N-Gain

| Learning | *n* | N-Gain | | Normality Test | Average of Difference Test | Interpretation |
|---|---|---|---|---|---|---|
| | | $\bar{x}$ | *s* | | | |
| RL | 79 | 0,55 | 0,18 | Not normal distributed | $H_0$ is rejected | There is difference |
| CL | 76 | 0,34 | 0,22 | Not normal distributed | | |

Annotation: $\alpha = 0{,}05$

 

From Table 4, it is seen that null hypothesis is rejected. It means that MRA enhancement data based on group of learning is different significantly in significance degree $\alpha = 0.05$. By noticing average value of those two groups, it can be concluded that MRA enhancement of student teachers who got RL is better than student teachers who got CL.

4.2 Discussion

The result of study had shown that RL give positive influence significantly toward achievement and enhancement of student teacher's mathematical reasoning ability. Based on findings of this study, it can be stated that learning factor give influence to student activity in class during learning process. On the other word, the result of study show that RL is significantly better in enhancing MRA. This result of study strengthen and complete earlier study results about RL among other the study which is done by Nainggolan (2011), Lasmanawati (2011) and Zulmaulida (2012) who concluded that RL is better than CL in enhancing mathematical ability and mathematical ability in students of elementary school, secondary school and college.

Based on characteristic between RL and CL, it is normal that there is difference in ability result which is obtained by students after following learning. In reflective learning, students who are trained and habituated to think mathematically through problem solving items, and reflection questions from lecturer and teaching material. Therefore, students will be skillful in collecting relevant information, analyze information, and realize how important to retest the result which has been obtained. Finally, students will have ability to take decision which is part of mathematical reasoning indicator. As asserted by Conney (in Hudojo, 1988:119) that teaching problem solving to learners enable them to become more analytic in making decision in their life.

Student is given opportunity to play active role in learning process, especially when holding discussion (group discussion and class discussion). Student organize ideas and knowledge he/she has related with problem, in addition, student can ask the question or issue around the problem. Next, student is given opportunity to say what they understood or not understood. When group discussion take place, lecturer walk around the class watching the discussion. If necessary, lecturer as facilitator can give direction or scaffolding to students to make connection among mathematical concepts and procedures. Scaffolding which is given by lecturer is kind of reflective questions which help students when they experience difficulty in solving the problem. This is parallel with Baig and Anjun statement (2006) that atmosphere of class which is friendly is very supporting enhancement of learners' reasoning ability because they will argue, ask questions and describe their thinking without hesitant.

The writing of reflective journal in the end of learning, capable to record connections and meanings acquired by students during learning process, so help student to unite reflection process which has been done. As revealed by Coughlan (2007) that reflective journal is used by students to record the progress of their study which help them to find their learning strategy as evaluation of students' performance. Further, Coughlan (2007) stated that thinking and writing is a process which cannot be separated, writing reflectively is indirectly guide us to think about process of our own thinking or well known by term 'metacognition'. As suggested by Sternberg (1999) that metacognition activity is part of mathematical reasoning aspect.

Another strength of reflective learning is capable to facilitate cognitive aspect and affective aspect concurrently (ICAJE, 1993). This is seen when learning process take place. Students respect each other, have positive view and sensitive toward another member. Students respect each other when implementing learning, give opportunity to take turn when asking and answering question in group discussion and class discussion, or when presenting result of discussion in front of class.

Differed with CL approach in which lecturer is a model, center of learning process activity, knowledge resource, and less involve students actively in learning process. Lecturer explain the material in detail, followed by give example and the ways to solve the problem. Student notice lecturer explanation, then take a note what is explained by lecturer. Before student take a note, lecturer usually give time for students to ask about things which has not been understood. If there is student who ask the question, lecturer directly explain classically. Then, lecturer give exercise problems which are done individually, by walking around the class, lecturer notice how students do the exercise, and occasionally help to direct student who experience difficulty. After time is out to do exercise, all students collect the result of their work to be assessed by lecturer. In the time of discussion, some students are asked to do the problem in blackboard. Even though in conventional learning there is also ask-answer, but there is only two ways communication occurred which involve lecturer and students. Such learning process not conditioning multi ways communication which result in passive learning. If there is student who ask question or present the material, usually he/she is the same student. Routine problems

given in learning or exercise at home make students less develop their thinking potency and not feel challenged to delve the material further. In this case, students consider that learning is following lecturer's direction, not to be creative, and the most important is all material delivered by lectures is mastered. Besides, in CL students not being trained to do reflection toward their learning. As a consequence, students are less able to solve the problems which are more challenge and need higher thinking process such as mathematical reasoning.

## 5. Conclusion and Suggestion

### 5.1 Conclusion

Based on problem formulation, result of study, and discussion as had been revealed earlier, it is concluded that achievement and enhancement of mathematical reasoning ability of student teacher who got RL is better than student teacher who got CL. Mathematical reasoning ability enhancement of student teachers who got RL and CL is categorized medium. MRA achievement of student teachers who gt RL is categorized enough, whereas student teachers who got CL is categorized inadequate.

### 5.2 Suggestion

a. This result of study showed that students' MRA is less developed well in conventional learning. Therefore, it is suggested for lecturer to apply non CL which is based on constructivism in developing mathematical thinking ability particularly in MRA. It is better that RL made to become learning model alternative.
b. This result of study less achieve optimal result, it is seen from average of students' MRA achievement still categorized enough, whereas its enhancement is categorized medium. For the other researcher or lecturer who will apply RL, it is suggested to: a) give enough time for students to work independently before progressing to discussion activity; b) management and setting of class which is conducive in order that lecturer mobility in interacting with students is smother; c) lecturer should be attentive and wise in perceiving student's reflective journal.
c. Learning process in reflective learning trigger complex didactical situation which demand lecturer/teacher to be perceptive to didactical situation faced, being able to do varied didactical actions (for example in giving scaffolding or reflective questions), being able to accommodate various students/college students responses, and all at once being able to manage learning time well.
d. The other researcher is suggested to optimize function of reflective journal in evaluating progress of student's thinking ability in the end of semester through project assignment or portfolio.

## References

Ansjar, M. & Sembiring (2000). *Hakikat Pembelajaran MIPA dan Kiat Pembelajaran Matematika di Perguruan Tinggi*. Jakarta: Dirjen Dikti Departemen Pendidikan Nasional.

Baig, S. dan Anjun H. (2006). "Learning Mathematical Rules with Reasoning". *Eurasia Journal of Mathematics, Science and Technology Education.* **2**, (2), 15-39.

Baroody, A.J. (1993) *Problem Solving, Reasoning, and Communicating, K-8 (Helping Children Think Mathematically)*. New York : Macmillan Publishing Company.

Coughlan, A. (2007). *Reflective Learning: Keeping A Reflective Learning Journal*. DCU Student Learning Resources.

Creswell. (2009). *Research Design Pendekatan Kualitatif, Kuantitatif, dan Mixed Edisi Ketiga*. Yogyakarta: Pustaka Pelajar.

Hudojo, H. (1988). *Mengajar Belajar Matematika*. Jakarta: Dirjen Dikti-Depdikbud

Hussin, Z. & Saleh, F. (2009). Amalan Reflektif dalam Pengajaran Matematik: Satu Kajian Kes. Dalam *Jurnal Pendidikan Islam Jilid 13 Bil 2 Julai 2009 / Rejab 1430* [Online]. Available: http://i-epistemology.net/e-journal/jurnal-pendidikan-islam/1128-jurnal-pendidikan-islam.html. [20th of January, 2013].

ICAJE, The International Commission on the Apostolate of Jesuit Education. (1993). *Ignatian Pedagogy: A Practical Approach*. [Online]. Available: http://www.rockhurst.edu/media/filer_private/uploads/ignatian_pedagogy_a_practical_approach.pdf. [27th of December, 2013].

Insuasty, E.A. dan Castillo, L.C.Z. (2010). Exploring Reflective Teaching through Informed Journal Keeping and Blog Group Discussion in the Teaching Practicum. *PROFILE: Issues in Teachers` Professional Development Vol.12 No.2, October 2010. ISSN 1657-0790. Bogotá, Columbia. Pages 87-105.*

Kurnia, I. (2006). *Pengembangan Model Pembelajaran untuk Meningkatkan Kemampuan Reflektif Mahasiswa S1-PGSD pada Mata Kuliah Penelitian Tindakan Kelas.* Dissertation in Curriculum Development, School of Post Graduate Studies, UPI.

Lasmanawati, A. (2011). *Pengaruh Pembelajaran Menggunakan Pendekatan Proses Berpikir Reflektif terhadap Peningkatan Kemampuan Koneksi dan Berpikir Kritis Matematis Siswa.* Thesis in Mathematics Education, School of Post Graduate Studies, UPI.

Mathematics Association of America. (2004). *Undergraduate Programs and Courses in the Mathematical Sciences: CUPM Curriculum Guide 2004*. Washington DC: The Mathematics Association of America Published.

Nainggolan, L. (2011). *Model Pembelajaran Reflektif untuk Meningkatkan Pemahaman Konsep dan Kemampuan Komunikasi Matematis.* Thesis in Mathematics Education, School of Post Graduate Studies, UPI.

NCTM. 2000. *Principles and Standards for School Mathematics*. Reston, Virginia: NCTM.

Poblete, D.P. (1999). A *Reflective Teaching Model: An Adventist Assessment.* Prepared for the 24th International Faith and Learning Seminar Held at Andrews University, Berrien Springs, Michigan, U.S.A.

Radulescu, C. (2013). Reinventing Reflective Learning Methods in Teacher Education. *Procedia - Social and Behavioral Sciences 78 (2013) 11 – 15.*

Ruseffendi. (2005). *Dasar-dasar Penelitian Pendidikan dan Bidang Non-eksakta Lainnya*. Bandung: Tarsito.

Senger, E.S. (1999). Reflective reform in Mathematics: The recursive nature of teacher change. *Educational Studies in Mathematics*, 37, 199-221.

Sirajuddin. (2009). Model Pembelajaran Reflektif: Suatu Model Belajar Berbasis Pengalaman. In *Didaktika Jurnal Kependidikan* Vol 4 No.2 hal 189-200.

Song, H.D., Koszalka, T. A., and Grabowski, B. (2005). Exploring Instructional Design Factors Prompting Reflective Thinking in Young Adolescents. In *Canadian Journal of Learning and Technology*, Vol 31, No. 2, 49-68.

Shadiq, F. (2007). Penalaran atau Reasoning, Mengapa Perlu Dipelajari Para Siswa di Sekolah?. [Online]. Tersedia: https://fadjarp3g.files.wordpress.com/2007/09/ ok-penalaran_gerbang_.pdf. [19th of January, 2015].

Sternberg, R. J. (1999). *The Nature of Mathematical Reasoning* dalam Lee V. Stiff dan Frances R. Curcio (edt) Developing Mathematical Reasoning in Grades K-12, 37-44. Virginia: NCTM.

Sugiyono. (2009). *Metode Penelitian Pendidikan.* Bandung : CV. Alfabeta.

Suherma, E. dan Winataputra, U. *(1992). Strategi Belajar Mengajar Matematika,* Jakarta: Penerbit Universitas Terbuka.

Sukmadinata, N.S. (2008). *Metode Penelitian Pendidikan*. Bandung: Remaja Rosdakarya.

Wahyudin. (2008). *Pembelajaran dan Model-Model Pembelajaran.* Bandung: UPI

Zulmaulida, R. (2012). Pengaruh Pembelajaran dengan Pendekatan Proses Berpikir Reflektif terhadap Peningkatan Kemampuan Koneksi dan Berpikir Kritis Matematis Siswa. Thesis in Mathematics Education, School of Post Graduate Studies, UPI.

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