

EVALUATION ON REALISTIC MATHEMATICS EDUCATION INDONESIA IMPLEMENTATION IN FACULTY OF EDUCATION SCIENCES SRIWIJAYA UNIVERSITY PALEMBANG

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ABSTRACT

The objective of this research was to evaluate the effectiveness of PMRI implementation organized by FKIP UNSRI Palembang at two elementary schools in Palembang. It was an evaluation research by Frechting's Logic Model and by context component as complementary. Triangulation used as credibility test to check the validity of data. Data source triangulation was done to the PMRI central team, PMRI local team, principals, teachers, and students. Meanwhile, data collection techniques triangulation was gotten from questionnaires, interviews, and document observations. Model analysis applied in this research was qualitative. The result of research gave conclusion that the PMRI implementation by FKIP UNSRI has been quite effective. There were several things that have not been appropriate with PMRI standards i.e. the preparation of teaching materials in SDN 98 did not run optimally because the school used regulated thematic teaching materials by provincial government and some teachers did not use evaluation system with PMRI standards.

Keywords: *evaluation, implementation, realistic mathematics education.*

To learn mathematics, students are required not only to 'know about' but also to 'master' mathematics. Therefore, using sufficient learning method to learn mathematics in classroom is important in order the students to obtain standard competences in mathematics as in Decision of Minister of National Education Number 23 Year 2006 on Graduates Standard Competence that students are capable to think logically, critically, and creatively to solve simple problems in daily life, to show sense of high curiosity in learning, and to acknowledge natural and social symptoms around them. Accordingly it is stipulated that Realistic Mathematics Education (RME), developed by Institute Freudenthal, is the consideration and referral material for better Mathematics education in Indonesia.

RME theory as realistic mathematics learning is based on Hans Freudenthal's vision on mathematics should be correlated with life experiences and be relevant to the social life to make mathematics useful in student's daily life. Further, mathematics as human activity makes mathematics learning at school compulsory to help students constructed their understanding on mathematics freely with teacher's guidance. This is indicated that the main objective of mathematics learning is more to the discovery process of mathematics concepts and ideas rather than a close system (Freudenthal in Panhuizen, 2000: 3).

The idea is explicitly formulated into two types of mathematics, namely horizontal and vertical mathematics. Horizontal mathematics is a condition of mathematics as human activity or real problems in real life which students decode into mathematics languages and symbols. Vertical mathematics is a condition when students use the system of mathematics to

solve problems that have been decoded into mathematics languages and symbols.

Due to the aforementioned changes in process, teacher's attitudes and roles in the learning process is no longer dominant. Teacher is expected to facilitate and motivate passive students to become active, creative, and innovative, which is known as student center learning.

PMRI is adopted from RME and adapted to education in Indonesia. PMRI contains Freudenthal's reformative ideas, such as: (1) mathematics is human activity rather than a tool, (2) the implementation of two types of mathematics, namely horizontal and vertical mathematics, (3) emphasis on student center learning rather than teacher center learning; and PMRI central team's innovative ideas of principles of PMRI implementation, namely: (1) the implementation of PMRI use bottom-up model through local or national start-up workshops and (2) LPTK lecturers will assist the implementation through local workshop.

PMRI has been implemented in more than 1000 elementary schools in Indonesia for more than 10 years (2001-2012). Three groups of LPTK was formed as dissemination results through different methods and reasons during the implementation. PMRI trial was organized in only 8 public elementary schools (SDN) and 4 public madrasah elementary schools (MIN). Lecturers who involved in PMRI trial, introduced PMRI to the teachers in many opportunities, both formal and informal, and through local or national workshops. After knowing about PMRI, teachers were expected to implement it in the classrooms. PMRI teams who gave workshops are not allowed to force teachers to implement PMRI. It is fully teacher's consent and choice to continue implementing PMRI with its consequences in the classrooms. PMRI central team identify this process as bottom-up model (Suryanto, 2010: 18-52).

Some local and national workshops were organized to get partner schools. Some of the local workshops were visited by consultants from the Netherlands. These workshops are called the Quality Boost activities (Suryanto, 2010: 73). Teachers from partner schools get information about PMRI from local LPTK lecturers, meanwhile, in a Quality Boost activity, local LPTK lecturers get information and consultation about PMRI from the foreign consultant to step up their performance. Local start-up and follow-up workshops were organized to get more school partners.

The challenge to implement PMRI thoroughly is hard, hence it needs good cooperation of all parties involved to develop and disseminate PMRI. It is hoped that PMRI will enhance the quality of mathematics education in Indonesia. Furthermore, PMRI is an evolving rather than a finished learning method. Thus it needs evaluation in order to balance and adjust to the demands.

Therefore, evaluation of PMRI implementation in some provinces in Indonesia in 10 years is needed. This research was conducted by FKIP UNSRI and SDN 98 and MIN 2 Palembang.

Crawford (2011: 1) argues that evaluation in education is aimed to: (a) plan education program, (b) implement education program, (c) determine results in education program, and (d) develop and settle education program.

There are many other definitions to wrap up and to show the importance of evaluation. Fort, Martinez, and Mukhopadhyay (in Mertens 2005: 47) argue that evaluation is defined as periodic assessment of the relevance, performance, efficiency, and impact of the project in relation to state objectives. Patton in Mertens, argues that there is change in defining evaluation that is a process and activity to support individual or organization's program, project, and product. Bennet (2006: 7) explained that research evaluation contains: (a) focus on new program introduction, (b) analysis and conclusion of the empirical data, (c) other conclusion or assessment of the data, (d) research publication, and (e) providing information to the policy makers based on the result and findings.

Formative evaluation is an evaluation as feedback and assessment to program effectiveness and progress (Weiss in McDavid, 2006: 3). The terminology of evaluation model is used in two ways, i.e. perspective and descriptive evaluation models. Perspective evaluation model is a model that uses a set of rules, guidelines, and specific procedure for what and how the evaluation should be done. Descriptive evaluation model is a set of statements that describes and explains the activity of evaluation. Evaluation model is also based on aspect, process, and symptom. Aspect based evaluation model is a model of evaluation that is used for a certain substance of the program. Process based evaluation model is a model of evaluation that is based on stages of activity process, e.g. feasibility study or formative evaluation. Symptom based evaluation model is a comprehensive model of evaluation in a program, e.g. CIPP evaluation, Logic Model, and Goal-Free evaluation (Alkin, 2004: 13-59).

To evaluate the implementation of PMRI in Indonesia, correct model of evaluation is needed. Frechting's Logic Model (2007: 21) is a way of visually depicting the theory of change underlying a program, project or policy on inputs, activities, outputs, and outcomes. It is used in this research because it is in accordance with the establishment and implementation of PMRI in which input component influenced some partner school to join PMRI. Activity component is about the implementation of PMRI in collaboration between universities in Indonesia and partner schools. Output component is expected direct results of development of learning materials for the teachers and the improvement of learning outcomes for the students. Outcome component is product component that gives teachers improvement of teaching skills and gives students positive attitude towards mathematics and capability to formulate and utter opinion, to gain self-confidence, and to be more prudent to respect others opinion.

However, Logic Model cannot be used as the only model to evaluate the implementation of PMRI. It needs context component as an additional components in a Logic Model which describes the important features of the environment in which the project takes place, such as new educational mandates (Frechting, 2007: 20) which for PMRI is reformative ideas from Freudenthal and innovative idea from the central team as the foundation of PMRI.

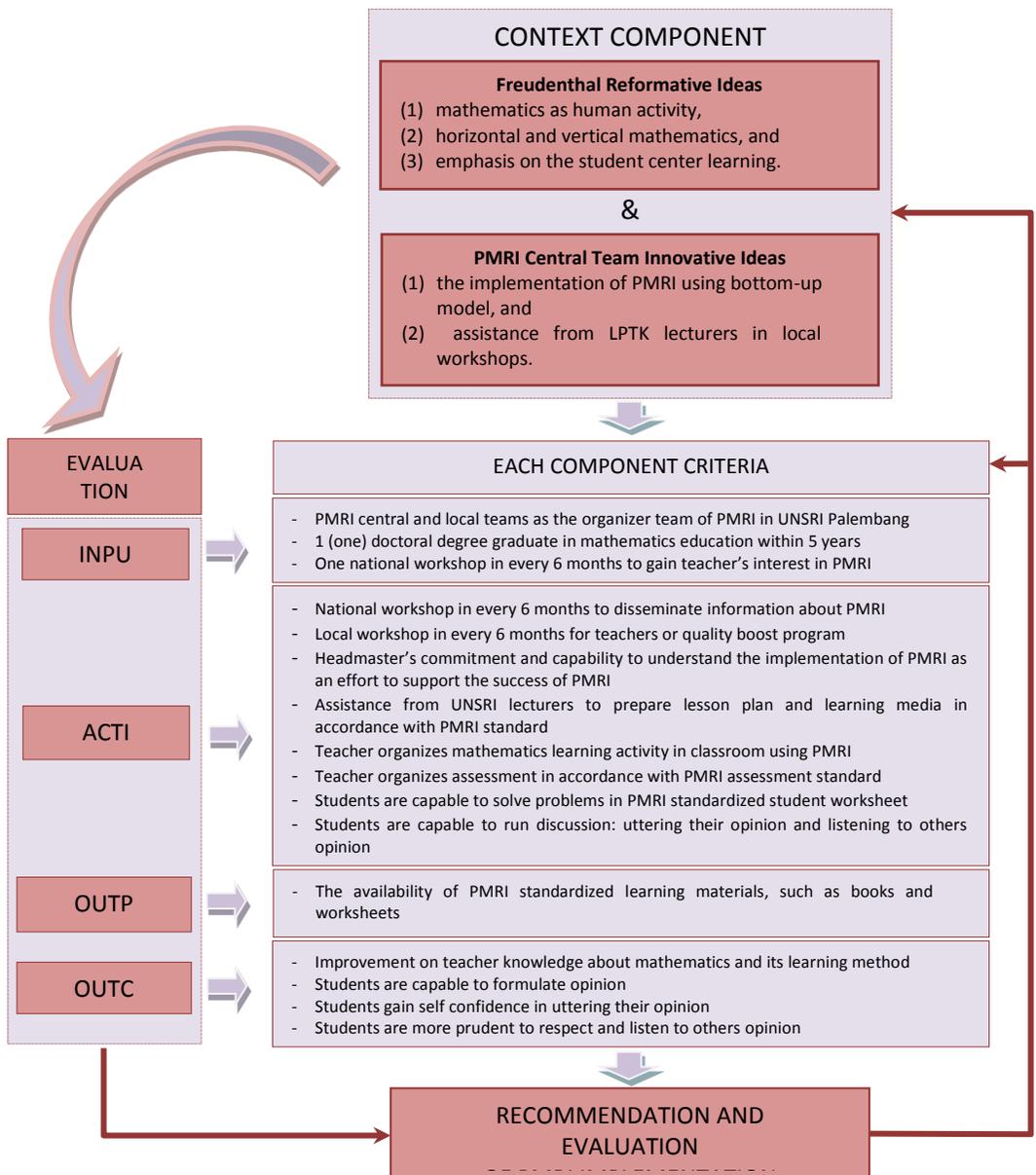
This research also used Cluster Evaluation model since the result of evaluation program which is collected individually considered as group

result because of similar objective and strategy in bigger population (Fitzpatrick, Sanders, and Worthen, 2004: 475).

The objective of this research is to see the effectiveness of implementation of PMRI organized by FKIP UNSRI in collaboration with SDN 98 and MIN 2 Palembang as partner schools.

METHOD

This research was carried out from March to October 2013. Data resource is primary data resource which obtained from observation in each location. FKIP UNSRI derived from the second group (Cluster 2) of LPTK joined PMRI. FKIP UNSRI was chosen because it represented groups based on the time of occurrence and the geographical location of PMRI (Fitzpatrick, Sanders, and Worthen, 2004: 473). FKIP UNSRI in Cluster 2 represented location based on time of occurrence of the research because one of the lecturers in FKIP UNSRI is a doctoral degree graduate in mathematics education and studies RME, whereas there is no doctoral degree graduate in mathematics education in Cluster 1 and 3. FKIP UNSRI Palembang in Cluster 2, which consists of 4 universities in Sumatra Island (West, South, and North) and Borneo Island, represented location based on geographical location because Palembang in South Sumatra Island considered to be dominant location among other cities in Cluster 2.



Graphic 1. Program Evaluation using Logic Model and Context Component

Preliminary study was carried out to seek for comprehensive information on the implementation of PMRI in FKIP UNSRI Palembang. Information was obtained by correspondences with PMRI local team in UNSRI Palembang. The main objective of preliminary study was to get consent and willingness of UNSRI Palembang to be the organizer and information center of PMRI and to get description of situation of partner schools SDN 98 and MIN 2 Palembang.

Approach in the evaluation of implementation of PMRI was carried out qualitatively. Qualitative approach focuses on exploration, disclosure, and inductive logic (Patton, 1990: 41); it is naturalistic and effective to

assess variety of program implementation (Patton, 1990: 124). This research used evaluation method that is not only intended to prove the truth or test the hypotheses as in quantitative research but also to refine a certain program or policy using the obtained information (Stufflebeam and Shinkfield, 2007: 9) or is the systematic process to determine and make decisions on the program outcomes according to the predetermined criteria (Grolund in Djaali, 2008: 1).

To develop the instrument, researcher compiled points and grids of instrument obtained by studying the underlying theories. There are two types of points of instrument, namely point of instrument which in the form of (a) quantitative data, such as questionnaire and (b) qualitative data, such as interview guideline and observation report. To validate the concepts of instrument, instrument validation should be carried out by experts and panels. Instrument validation was carried out by two experts in evaluation field and panel of 20 respondents consisted of lecturers of Mathematics Department FMIPA UNJ and PGSD Department FIP UNJ. To analyze the panel results, Lawshe's (in Naga, 2012: 316) Content Validity Ration (CVR) was implemented using criteria of CVR or CVI interpretation score.

To validate the data and to test the credibility, researcher used data triangulation. Data source triangulation was carried out by PMRI central team, PMRI FKIP UNSRI team, headmasters, teachers, and students in SDN 98 and MNI 2 Palembang. Data collection method triangulation was done by using questionnaire, structured interview, and document observation. Data collection was done in April 2013 in Palembang. Other data was collected in mailing list between PMRI FKIP UNSRI team and teachers. In October 2013 in Palembang, conformability was done to test the data validity and information accuracy.

There are three steps of further testing; transfer ability to test detailed research report, depend ability to test the track record of research implementation, and conform ability to test the research results in accordance with the process (Sugiyono, 2012: 366).

Data analysis procedure implemented in this research is qualitative data analysis, i.e. (1) note down the result of data collection into components, (2) reduce the data if special case occurred, (3) create alternative classification system if special case occurred, (4) present data in all components, including in the alternative category, and (5) draw conclusion to obtain relevant decision (Silverman, 2001: 237).

RESULTS AND DISCUSSION

In general, the implementation of PMRI in FKIP UNSRI Palembang was conducted using direct interview and document study. Details are as follow: (1) FKIP UNSRI, respectively Prof. Dr. Zulkardi, M.Kom., organized PMRI at the end of year 2012, (2) FKIP UNSRI organized PMRI dissemination and implementation activities in South Sumatra areas, (3) UNSRI Palembang and UNESA Surabaya in collaboration with Utrecht University established an international master degree program in PMRI, (4) PMRI learning environment used learning environment in campus,

classroom, and Teachers Workforce (KKG) to generate core teachers, (5) Center for PMRI Research and Development (P4MRI) UNSRI internet blog on www.p4mriunsri.wordpress.com and website on www.p4mri.net was created to support the dissemination of PMRI, (6) Starting from 2009, International Master Programme on Mathematics Education (IMPoME) used PMRI/RME in the core curriculum, this was follow-up action of PMRI implementation in UNSRI.

The followings are result of evaluation and discussion on PMRI implementation in every component:

1. Input Component

Input component determine the activity. Input component consists of (1) organizer team, i.e. PMRI central and local FKIP UNSRI teams and (2) activities, i.e. national workshop organized by PMRI central team. Therefore, evaluation of input component is obtained from PMRI central and local FKIP UNSRI teams.

Evaluation on PMRI implementation in input component showed that PMRI central team in UNSRI, respectively Prof. Zulkardi was always in charged during the implementation of PMRI because he is a resident professor in UNSRI. Dr. Ratu Ilma Indra Putri, M.Si. of PMRI local FKIP UNSRI team was in charged during the implementation of PMRI in partner schools. This showed that the implementation of PMRI in partner schools was planned, directed, and monitored.

Despite it was uneven, the monitoring and evaluation on implementation of PMRI was carried out between central team to local organizer team in LPTK or university. Monitoring activity is aimed to create discussion and to exchange information on effective and successful implementation of PMRI between internal teams. Local FKIP UNSRI team maintained the monitoring activity during or in between national workshops.

Local FKIP UNSRI team, as PMRI organizer, commits to produce or add one Doctor of mathematics education to the faculty. Lecturers who involve in PMRI are advised to continue their study to doctoral program on mathematics education. Local UNSRI team in an interview said that three resident lecturers who also prospective Doctors of mathematics education will graduate by 2013.

PMRI central team as the founder is responsible to introduce and disseminate information about PMRI to teachers through national workshop. Evaluation result found that teachers in SDN 98 and MIN 2 Palembang were rarely involved in national workshops. This happened because lack of travel budget impede teachers to attend national workshop outside Palembang, whereas national workshops was often organized in different places. However, the implementation of PMRI ran smoothly. Teachers were still able to join regular local workshops organized by local FKIP UNSRI team.

Because lecturers are subsidized by their resident university to join seminar or workshop out of town, PMRI national workshop is often full of mathematics lecturers. FKIP UNSRI PMRI team sent mathematics lecturers to national workshop to get better understanding about PMRI.

2. Activities Component

Activities component is aimed to evaluate activities organized by local FKIP UNSRI team, headmasters, teachers, and students. Activities which were evaluated are national and local workshops, headmaster policies and supervision, and learning activities, in particular mathematics learning activities. National workshop once in every 6 (six) months which is conducted by central team aimed to disseminate information and updates about PMRI. FKIP UNSRI send mathematics lecturers to join the national workshop in order to get updated about PMRI.

National workshop is not necessarily held once in every 6 (six) months, once a year is enough. Local workshops on PMRI implementation at school organized by LPTK or university partner give many benefits to the teachers. National workshops are needed to disseminate new information about PMRI to LPTK or university partners as well as school partners.

Although it is not always quality boost program assisted by instructor and expert from the Netherlands, local workshops which organized in every 6 (six) months facilitate lecturers to gain new knowledge and get recent information about PMRI. Doctor in mathematics education regularly attend the local workshops to discuss mathematics learning method using PMRI. Teachers or headmasters who are interested to implement PMRI at their school should join local workshops in their area.

Headmaster policy on management and administration determines the success of PMRI implementation. Headmaster's role in implementing PMRI into school policy is very important. However, the role of headmaster becomes less important if PMRI is considered as learning strategy. In this case, teacher's role as organizer of learning activities at class is more important.

For instance is a case in MIN 2 Palembang. In 2010, there was replacement of school headmaster and the implementation of PMRI still ran smoothly. This happened because, firstly, the new headmaster committed to continue the implementation of PMRI. Secondly, teachers in MIN 2 Palembang already implemented PMRI since 2006 and they wanted to continue implementing it into mathematics learning.

Different case happened in SDN 98 Palembang. There were no headmaster replacement in SDN 98 Palembang since the school collaborated with FKIP UNSRI to implement PMRI. Furthermore, the headmaster of SDN 98 made policy to replace mathematics teachers in grade 1, 2, and 3 to higher grades. Therefore, the new teachers should be trained with and introduced to PMRI through local workshops. This policy is considered ineffective.

It is compulsory for teacher to make lesson plan. Teachers at SDN 98 and MIN 2 assisted by lecturers from FKIP UNSRI to prepare PMRI standardized lesson plan and learning materials. Evaluation result in MIN 2 Palembang showed that teachers were helped by graduate students of mathematics education program who study about PMRI to prepare lesson plan. The graduate student is considered to be a substitute for lecturer to assist implementation of PMRI under observation and monitoring from graduate school lecturers.

It is compulsory for teachers in SDN 98 to follow learning materials made by local KKG. The learning materials are thematic and integrated with other subjects. This gives advantage to implement PMRI because PMRI believed that learning mathematics should be integrated with other subjects and in structure (intertwinement) (Bekker, 2004: 6). However, implementing PMRI also gives teachers difficulty with time management. PMRI needs longer time in classroom and well prepared lesson plan. Therefore, graduate student assistance in preparing lesson plan, especially learning media, is still needed.

Evaluation of learning mathematics in both elementary schools, SDN 98 and MIN 2 Palembang, showed similar results, which are:

- (1) Learning activity starts with real problem in real life,
- (2) Students are given opportunity to explore the problem and exchange opinion with peer or group; discussion improve students' concept understanding,
- (3) Learning activity linked many mathematical concepts to make learning more efficient, and
- (4) Learning activity ends with conclusion of mathematical concepts as confirmation process, extra exercises are needed for better understanding.

There is one aspect in the implementation of PMRI to teach mathematics in classroom that teacher rarely does. In some learning materials teacher rarely gives opportunity to the students to learn mathematics thoroughly and to realize that mathematical concepts are interconnected. Therefore, innovative and creative ideas in teaching mathematics are needed in order students are capable to obtain a thorough understanding of concepts.

Evaluation of teacher's role in classroom learning activity using PMRI in two elementary schools showed that (1) teacher as a facilitator so learning activity is student center rather than teacher center (Bekker, 2004: 6), (2) teacher is capable to create interactive learning to make students interested and motivated, (3) teacher gives opportunity to the students to be active in discussion about real problem solving (horizontal mathematics) (Gravemeijer, 1994: 21), and (4) teacher is capable to connect the curriculum to the real world problems (mathematics as human activity) (Panhuizen, 2000: 3).

In the assessment process using PMRI standards, teacher assesses not only students' worksheet but also students' attitude towards mathematics. This assessment is obtained from class observation while students are running discussion or presenting in front of the class. Evaluation of assessment process in both of the partner schools showed that the class observation data were invented disorderly and the data collected were only numbers and scores without any description. However, through interviews teachers were capable to distinguish students' attitude towards mathematics.

Students' ability to study individually and in group determine the success of implementation of PMRI. Student's ability in solving problems in the worksheet is evaluated individually. Meanwhile, student's ability in learning in group evaluation was evaluated on student's activities in group discussion, whether he/she is able to utter his/her opinion, he/she able to respect others opinion, he/she is able to handle critics. Result from interviews

and evaluation showed that most of the students looked accustomed to tell their opinion and to listen others opinion. They were not shy and awkward to talk to new people. The only barrier was in language factor. Most of the lower grade students (grade 1, 2, and 3) talked in thick Palembang accents.

3. Output Component

Teachers at SDN 98 Palembang use learning materials made by local KKG in place of PMRI learning materials. However, mathematics teachers at SDN 98 referred to stages of learning process by PMRI, which begins with real problem in real life to direct the students to mathematical concepts.

Evaluation results on learning materials used in MIN 2 are: learning materials are made by teachers with assistance from facilitator in UNSRI, therefore, the learning materials meet 4 to 5 criteria of PMRI learning materials, i.e. (1) learning material using real problem to help students understanding mathematical concepts, (2) learning material connects many mathematical concepts to give students opportunity to understand mathematics thoroughly, (3) learning material contains many activities that trigger motivated and innovative ideas for the students, (4) learning material contains many activities to improve interaction and cooperation among students. However, MIN 2 Palembang has not developed learning material for remedial as well as advanced activity to accommodate variety of students learning ability. Learning materials has not provided extra activity for above average students and also has not provided remedial activity for below average students (PMRI, 2012: 6).

Learning outcomes in both partner schools after using PMRI showed insignificant improvement because teachers still used conventional evaluation and assessment on student cognitive ability. Teachers in both schools were not accustomed to compose description about student's attitudes towards mathematics objectively. Teachers assessed student's attitude using observation sheet during class discussion.

4. Outcome Component

Improvement of teaching ability has been in accordance with PMRI standards, namely (1) teacher has knowledge and skill of PMRI and implements it to create conducive learning environment, (2) teacher assists students in the class discussion to encourage initiative and creativity, (3) teacher assists and encourages students to be accustomed in uttering opinion, ideas, and strategy to solve problems, (4) teacher manages group or class discussion, and (5) teacher and students draw conclusion on mathematical concepts through reflection and confirmation process (PMRI, 2012: 6).

Evaluation results on student's attitude towards mathematics are as follows: (1) students are active in discussion and asking questions, (2) students are capable to utter and defense opinion, as well as to respect others opinion, (3) students are capable to work in group, and (4) students gain self-confidence.

There are a few attitudes that have not observed to meet the PMRI standards, i.e. (1) students are not capable to handle critics from peer and (2) students do not prepare supporting materials of subject or problem that is in

discussion (Hadi, 2005: 12). Both of those deficiencies may be out of sight because it is harsh critics that student cannot handle, and there are limited resources to access new information of supporting material in their schools.

5. Context Component

Context in the evaluation is to have rational to the objective of implementation of PMRI in relevant environment which is schools, elementary to senior high, in order to improve the quality of mathematics education in Indonesia. An empirical analysis prior to this research showed that mathematics education in Indonesia needs PMRI to implement Freudenthal's reformative ideas in classroom learning activity and PMRI team's innovative ideas in cooperating with partner schools.

In the context component, the question of whether Freudenthal's reformative ideas as the foundation of implementation of PMRI have been implemented correctly will always come up. Freudenthal's reformative ideas must settle in every mathematics learning activity; therefore teacher who implements PMRI should enforce them in classroom. The reformative ideas are as follow (1) teacher enforces student center rather than teacher center learning model; mathematics cooperative learning makes students more active, creative, and innovative, (2) teacher implants a reformative idea that mathematics is human activity rather than a tool to students by converting the curriculum into individual and group learning activities, and (3) teacher uses horizontal than vertical mathematics to make basic concepts of mathematics easier to lean and understand; students use vertical mathematics to study advanced concepts.

Teachers at SDN 98 and MIN 2 Palembang who implement PMRI are aware of how PMRI should implement in classroom. However, they have difficulty in managing short lesson time. Learning mathematics using PMRI need longer time to achieve the standards.

Implementation of PMRI in schools, especially in elementary schools, should use bottom-up model. Teachers have full consent to whether implement PMRI or not. PMRI central and local teams cannot force teachers to implement PMRI. Teachers are invited to the routine national and local workshops on mathematics learning using PMRI. If teachers are interested in implementing PMRI in their classroom, PMRI team will approach their headmasters and make agreement. Headmaster should commit to implement PMRI after the agreement between school and PMRI team settled.

PMRI central team, consists of university or LPTK lecturers, will assist teachers to prepare lesson plan, learning material, and assessment tool in PMRI standards.

Although FKIP UNSRI lecturers still maintained giving assistance to teachers, mathematics education program graduate students who study PMRI occasionally substituted them, under supervision.

CONCLUSION

After exposure and discussion, it is concluded that evaluation results of implementation of PMRI carried out by FKIP UNSRI Palembang in SDN 98 and MIN 2 Palembang, as follows:

- (1) Input components in the implementation of PMRI in SDN 98 and MIN 2 Palembang has met set criteria.
- (2) Activity components, which determine the success of implementation of PMRI, has met standards of PMRI.
- (3) Output components involve teacher and students. Criteria in output components include the availability of learning materials in PMRI standard. Case happened in SDN 98 that local KKG provided thematic learning materials to be used in schools therefore they did not achieve PMRI standards. Different case happened in MIN 2 that teachers, assisted by FKIP UNSRI lecturers and/or graduate schools students, develop learning materials in accordance with PMRI standards. Significant improvement on learning outcomes have not occurred. However, after analyzing it thoroughly, the assessment was irrelevant. Students, however, get better understanding of basic concepts after learning mathematics using PMRI but because of the irrelevant assessment their learning outcomes was not significantly improved. Assessment system in accordance with PMRI standards should further develop and implement.
- (4) Outcome components in implementation of PMRI has fulfilled the set criteria. Teacher's ability in teaching mathematics as well as students' attitude towards mathematics has improved. Students do not consider mathematics difficult and frightening. Now, students can understand mathematics concepts easily. Students also have skills to run discussion actively, utter opinion, listen to others opinion, and handle critics.
- (5) Context components in implementation of PMRI has fulfilled the set criteria. Freudenthal's reformative ideas apply in every step of implementation of PMRI, especially in learning activity. Team in disseminating and implementing PMRI use bottom-up strategy consistently. Schools are not under compulsion to implement PMRI.

Recommendation

Implementation of PMRI in SDN 98 and MIN 2 carried out by FKIP UNSRI Palembang has run adequately, although improvements are needed in some parts as follows:

- (1) Directorate of Primary Education as policy maker should (a) support and enforce the implementation of bottom-up strategy, especially in PMRI dissemination and implementation efforts, (b) support PMRI to be implemented nationally, (c) support PMRI further development in Bachelor and Master education and assign FKIP UNSRI as PMRI education and training center for teachers and lecturer in Indonesia.
- (2) UNSRI and others LPTK, especially lecturers as organizer, that (a) the implementation of PMRI is also an opportunity to do community service because lecturers assist teacher to prepare and develop learning material and

learning media, and develop assessment instrument, (b) PMRI partnership gives mutual benefit for both parties, such as teachers in partner schools get professional assistance and consultation from LPTK and university lecturers, meanwhile, partner schools facilitate LPTK undergraduate students of education in internship program.

- (3) PMRI central team, for the sake of improvement, should: (a) make bolster program through national workshops to monitor, evaluate, and assist the implementation of PMRI periodically, (b) commit to organize national workshop once in every year to develop and update teacher's capability in teaching mathematics using PMRI, (c) evaluate the implementation of PMRI throughout Indonesia.
- (4) PMRI local team, for the sake of improvement, should commit to organize local workshops once in every six months to improve teacher's capability in implementing PMRI.
- (5) Headmasters of partner schools, especially SDN 98 and MIN 2 Palembang, should (a) commit to conduct effective and continuing supervision in the implementation of PMRI, (b) commit to facilitate periodical training activities to disseminate knowledge of PMRI for the teachers and to send teachers to join PMRI national and local workshops.
- (6) Teachers, especially at SDN 98 and MIN 2 Palembang, should be capable to do: (a) self and profession development periodically through discussion with local MGMP, (b) sustainable development in preparing learning materials and developing learning media and assessment instrument.
- (7) Students, especially at SDN 98 and MIN 2 Palembang, should (a) develop themselves in mathematics learning and be active learner in individual and in group learning condition, (b) have ability to transform attitudes towards mathematics, that mathematics is easy and fun.

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