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## **Improving Science Teachers Competence through Training of National Science Olympiad (OSN) (Community-Participatory Based Research at Madrasah Aliyah Town Jambi)**

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### ***Abstract:***

*National science Olympiad (OSN) is a prestigious event held gradually, starting from the city, provincial, national and international. This article describes the implementation of community-based participatory research (CBPR) as a method to engage school community in seeking solution how to improve science teachers' competency as a coach of National Science Olympiad at Madrasah Aliyah in Jambi's city. We provide background on our research program and specific implementation of active training program with thirty science teachers' at Jambi city. In conducting CBPR, we faced various challenges, including engaging researchers and community (ie. Teachers and school administration) in small group discussion and design enrichment training module based on teacher's response on a questionnaire distributed to them. This article describe the stages of implementation of CBPR in school community in Jambi's city*

**Keywords:** *National Science Olympiad (OSN), community-based participatory research (CBPR), teachers' competence, small group discussion, active training program.*

### **1. Introduction**

Science literacy is an important part of the education system in order to face the challenges of the 21st century. The organization for Economic Co-Operation and Development's (OECD) Programme for International Students Assessment (PISA) define scientific literacy as: "the capacity to use scientific knowledge, to identify questions and to draw evidence, based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human activity" (Bybee, 2009). In other words, scientific literacy describe as individual's ability to understand scientific laws, theories and phenomena. Intensive debate about scientific literacy emerged at 1990s inspired by concern about the educational demands of 21<sup>st</sup> century. Duit and Treagust (2003) give four arguments the importance of improving science literacy:

- The economic argument – modern societies need scientifically and technologically literate work-forces to maintain their competencies; (2) The utility argument – individuals need some basic understanding of science and technology to function effectively as individuals and consumers; (3) The cultural argument – science is a great human achievement and it is a major contributor to our culture; (4) The democratic argument – citizens need to be able to reach an informed view on matters of science –related public policies in order to participate in discussions and decision-making.

In order to face 21<sup>st</sup> century and gain scientific literacy, students need oppurtunities to develop abilities to solve complex problems, thinking critically, and work as a part of collaborative team and abilities to be competitive when they graduate and enter the workforce (Wirt, 2011). The Ministry of Education and Culture of the Republic of Indonesia through the Directorate General of Secondary Education has facilitated the activities that lead to the formation of competitive and creative students that able to mastery and develop science and technology, realize the diversity of the various aspects, and promote scientific attitudes through the implementation of the National Science Olympiad (OSN).

At senior high school level, purposes of National Science Olympiad (OSN) competition are (1) develop a healthy competitive climate in the environment of the learners at the school level, district / municipal, provincial, national and international; (2) to capture gifted students in primary and secondary education in mathematics, science, and technology to be prepared as member of the national

science olympiad team in international competition; (3) increase motivation of primary and secondary students in the mastery concept of mathematics, science and technology; (4) stimulate an increase in the quality of education, especially in mathematics, science, and technology; (5) increase the sense of fraternity and unity among the younger generation of Indonesia; (6) provides an opportunity to recognize the cultural diversity of the various regions in Indonesia.

Technically, the Science Olympiad held in some stages starting from school level selection, district / municipal, provincial and led to the National Science Olympiad (OSN). Based on the description above, OSN becomes one of important competition to be followed either by high school students or Madrasah Aliyah (MA) students in preparation for the competitive ability among students to compete in both national and global scale. But on the other hand there are many schools that are not yet fully prepared to follow the OSN competition due to lack of information and resources, both human and financial resources. This phenomenon also occurs in Madrasah Aliyah in Jambi province.

Based on data from the Department of Education Jambi Province revealed that the participation of MA students in OSN competition at district stage from 2012 until 2015 is very low. For each subject, the participation of MA students is no more than 7%. Indeed, the total percentage of students participation for all subject only 5%, remaining 95% is dominated by participant from general high school students. The main constraint faced by the Madrasah Aliyah is the lack of adequate teacher in fostering students due to lack of mastery concept that are contested in National Science Olympiad; schools are also face constraints to funding if it should call an instructor from outside of school.

Here, we discuss community-based participatory research (CBPR) as a method to engage school community in seeking solution. There is a growing body of evidence in support of the CBPR approach, which advocates that research in and of communities should involve the communities in question in all phases of the research (Israel, Schulz, Parker, & Becker, 2001). This study aims to address these key research questions : (1) How do we engage the school community members in these case science teachers at Madrasah Aliyah Jambi Town in order to improving science teacher competence in mastery science concept, (2) How the perception of science teachers about the implementation of Madrasah Aliyah in Jambi Town.

## 2. Science Olympiad Overview

National science Olympiad (OSN) is a prestigious event held gradually, starting from the city, provincial, national and international. Part of the Science Olympiad mission is to improve the quality of science education, increase interest in science for all students, as well as working towards creating passion for learning science, creating technology-literate workforce, and improving recognition for the outstanding achievement of students and teachers in the STEM (science, technology, education and mathematics) areas (Wirt, 2011). At senior high school level, purposes of National Science Olympiad (OSN) competition are (1) develop a healthy competitive climate in the environment of the learners at the school level, district / municipal, provincial, national and international; (2) to capture gifted students in primary and secondary education in mathematics, science, and technology to be prepared as member of the national science olympiad team in international competition; (3) increase motivation of primary and secondary students in the mastery concept of mathematics, science and technology; (4) stimulate an increase in the quality of education, especially in mathematics, science, and technology; (5) increase the sense of fraternity and unity among the younger generation of Indonesia; (6) provides an opportunity to recognize the cultural diversity of the various regions in Indonesia.

The research reveals that students who participate in Science Olympiad program have positive learning experience and attitude in learning science. (Hounsell, 2000) report that students who participated in Science Olympiad reported increased self-esteem, self-confidence, and heightened communication and teamwork skills. Based on work of Abernathy and Vineyard (2001) surveying 453 Science Olympiad participants reported that the respondents to their survey ranked "fun" as the number one reward for participating in a Science Olympiad competition.

## 3. Method

### 3.1. Identification of Target Population

We utilized data from Ministry Of Religious Affairs at Jambi's Province (Mapenda unit) to identify which Madrasah Aliyah will be the target for this CBPR program. In collaboration with Mapenda Unit, we mapped the total number of Madrasah Aliyah in Jambi's town and used three question to screen which Madrasah Aliyah will be choose for the target of study : (1) The science teachers from three Madrasah Aliyah is very necessary to get training about the National Science Olympiad Matter, given the lack of Madrasah Aliyah students participation in national science Olympiad competition, (2) students from three Madrasah Aliyah have high motivation and positive response to participate in the National Science Olympiad Competition, (3) The Madrasah Aliyah location is close to campus UIN SulthanThahaSaifuddin Jambi, so will be very easy for researchers to assist and monitor the continuity and sustainability of this program. According to these questions, we choose three Madrasah Aliyah that meet the requirements above, namely Madrasah Aliyah Negeri Olak Kemang, Madrasah Aliyah Swasta Laboratorium, Faculty of Education and Teacher Training Program UIN SulthanThahaSaifuddin Jambi, and Madrasah Aliyah Swasta As'ad.

### 3.2. Recruitment of Community Researchers and CBPR Participants

Researchers community in the implementation of CBPR consist of lectures whose have educational background in science field, that is lectures in physics, chemistry, biology and mathematic. Totally ten lectures from Faculty of Education and Teacher Training Program UIN SulthanThahaSaifuddin Jambi involved in this CBPR program. While the targets community-based participatory research (CBPR) is science teachers, which corresponds to 5 fields of science olympiad, physics, chemistry, computer, biology, and

earthscience. Each field is represented by two science teachers. A total of 30 teachers from 3 Madrasah Aliyah involved in this community-based participatory research.

### 3.3. Strategy and Data Analysis

The main purpose of this community-based participatory research program are to teaching and training science teachers to teach students with passion in order to mastery science Olympiad materials and to increase teachers' motivation in coaching science Olympiad at Madrasah Aliyah, by doing training for science teacher which combining content and pedagogy so that the National Science Olympiad materials are taught as dynamic, forward-looking and collaborative human endeavours. In order to achieve these goals, several strategies were used in this community-based participatory research :

#### 3.3.1. Doing Focus Group Discussion with the School Administration and Team Teachers at Madrasah Aliyah

At this stage, researchers given overview and doing focus group discussion with school administration (ie. The Principal) and science teachers about the purpose of science Olympiad competition, the importance of preparing teachers and students competence in order to participate and successful in national science Olympiad selection. The intent of focus group discussion was to explore and understand the relevant community characteristic that would be useful in designing effective intervention (ex. training program) to improve their teaching especially in coaching students to mastery in science Olympiad materials.

From this focus group discussion researchers get a lot of information about the main constraints faced by teacher when coaching students such as no adequate learning source about science Olympiad materials, teachers have never received basic training and continuous professional development program so that their competence as a science Olympiad coach is very low, and no networking system with other school coaches to share information and experiences. Researchers using this feedback from participant to well-designed in-service training program. Beside that, a questionnaire was circulated to all teachers' participants. In this questionnaire science teacher are asked to identify and list out the difficult concepts in national science Olympiad materials. These topics became basis for the preparation of modules. Modules consisting of enrichment material in each national Olympiad subjects such as physics, chemistry, earthscience, biology and computer.

#### 3.3.2. Active Training Program and Making Networking through Facebook

The second stage in this community-based participatory research is the creation and implementation of an active training program to improve science teacher competence as a coach of national science Olympiad. Active training is a method of enhancing human performance through learning activities which is designed to make participants more active in acquiring knowledge, rather than merely receive them (Silberman & Auerbach, 2006). Training was held in each school for three days. Pre- and post-test are used to measure knowledge and competency improvement from participating training program. A variety of learning experiences were used in this active training, including brainstorming, demonstration and discussion in a small group.

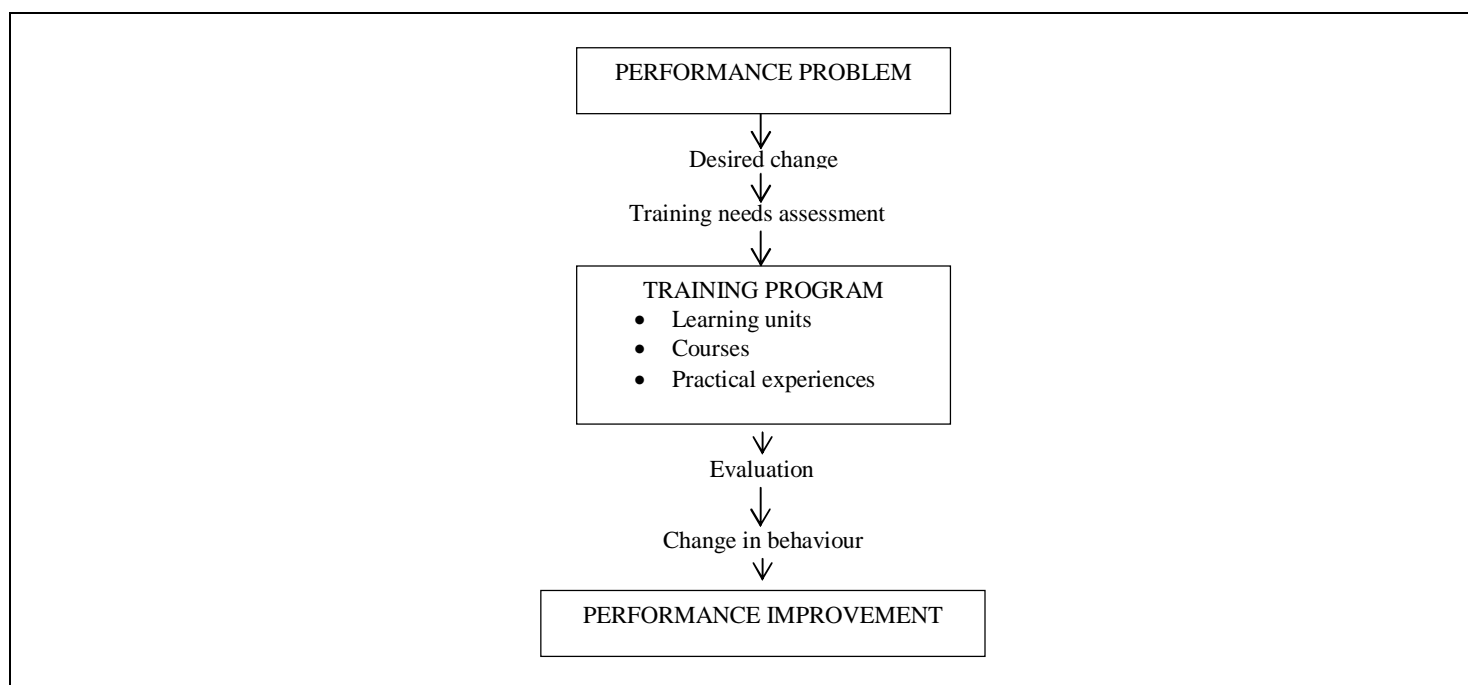


Figure 1: The training program flowchart

## 4. Result and Discussion

This study provided important insight on how best to improve teacher competence as a coach of National Science Olympiad. First, focus group discussion that researchers did in every school give a lot of information about participants' characteristic and the main

constraints faced by teacher when preparing students to follow National Science Olympiad competition and the best solution to overcome this problem. Researchers using feedback from participant respond to well-designed in-service training program and build networking system between coaches from another school using familiar social media (ie. Facebook). All of participant and students can join the group, sharing information about National Science Olympiad, and solving Science Olympiad problem together through this media.

Second, a variety of learning experiences. Brainstorming, demonstration, and discussion were used in this active training program as a intervention to overcome teachers' problem in coaching students to follow National Science Olympiad competition especially in mastery difficult concepts. In brainstorming session, all participants whose divided into small groups based on subject (physics group, chemistry group, earthscience group, biology group and computer group) are encouraged to contribute any suggestion that comes into their heads on a given subject. It also helps work group be more creative in decision making and problem solving. In discussion session, participants learn form one another with guidance from facilitator (researchers).

Third, National Science Olympiad training for teachers have brought a significant positive change in teachers' professional competencies. A significance increase in learning from pre-test to post-test showed an increase in the mastery of the concept of National Science Olympiad as shown graphic below :

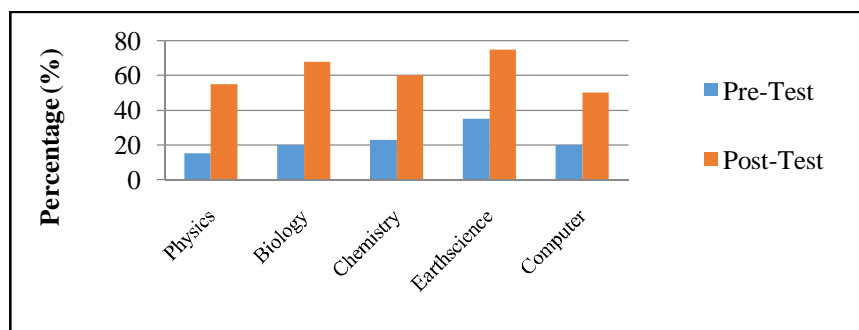


Figure 2: Score pre-test and post-test

Participants enjoyed the active training program, but wanted more time and reinforcement. Overall, participants believed that they obtained a good understanding of Science Olympiad and the goals of CBPR by participating in the active training program and interacting with academic partners. One of participant stated, "follow this training program is very useful because I can get some new ideas about how to train my students to get ready for this prestigious competence, and you can also do networking with other coaches that is very helpful, we are very good about helping each other". Another participant said, "Science Olympiad is very important, because through this competition students are able to do hands on activities in science and get that experience and see if they want to go on to a career in science someday and this training program very helpful because we can share learning resources and build network with another teachers from others school". However, the involvement of highly receptive, engaged community partners was also a key factor in project success. Support from school administration was also instrumental.

CBPR projects build power of community over time. The authors note that focus group discussion and active training program are very important step in building collaboratives, bidirectional research partnership. All participants expressed desire to future same training program in order to improve their teaching qualities.

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