

Professional Development of Teachers and Development of Teaching Material in Higher Order Thinking Skill (HOTS) with Mathematical Realistic Approach

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Abstract: In this globalization era, everyone is required to have the skills to think critically, creatively, communicatively, and collaboratively, and to have the ability in communication and information technology. This ability is called high-level thinking skills or Higher Order Thinking Skills (HOTS), so must be emphasized in every learning process at every level of education, especially mathematics education. However, HOTS of Indonesian students is still low (PISA, 2015). The reasons are because of the teacher's limited ability to think at HOTS and teaching materials that do not apply HOTS (Collin, 2014). Therefore, this scientific study aims to develop teacher professionalism in HOTS and develop teaching materials that do apply HOTS. Of the several alternatives in the professional teacher enforcement of the Directorate General of Primary and Secondary Education of the Ministry of National Education (2005), researchers in develop teacher professionalism in the MGMP empowerment program in the East OKU district area. While the development of teaching materials used is Realistic Mathematics Education (RME), which has been shown to increase students' understanding of mathematics learning so as to enhance students' understanding of higher-order thinking skills. So that collaboration between the development of teacher professionalism and the development of teaching materials is expected to improve HOTS of Indonesian students.

Keywords: HOTS, RME

Introduction

In this globalization era, every person is required to have the ability or skill to be able to compete, commonly referred to as 21st century skills. These skills include matters of critical thinking, creative, communication, and collaboration, as well as abilities in communication technology and information both actively and passively. To get there, the Higher Order Thinking Skills (HOTS) must be emphasized in every learning process at every level of education. Higher Order Thinking Skills need to be developed in school as a basic ability to jump in real life. This is confirmed by Marshall & Horton: "High Order Thinking Skills [HOTS], such as logical thinking, critical thinking and reasoning skills are the basic skills for daily life, apart from academic achievements in the schools" (2011). Mathematics is one of the strategic "homes" to teach this thinking ability. Therefore, knowledge and Higher Order Thinking Skills along with aspects of learning, should be mastered by teacher, especially mathematics teachers. "The nature and development of these skills, specifically in the context of teaching and learning must be understood by teachers in all sectors of education" (Armella & Santos-Trigo, 2013).

However, if the teacher does not have an understanding of HOTS, it is hoped that high-level learning will be difficult. This, as Collin reminded, "The ability to integrate HOTS into mathematics can be limited by a number of factors including HOTS's limited knowledge" (Collins, 2014). Mathematical learning which is oriented towards developing higher-order thinking skills requires adaptation of assessment activities. As in learning, assessment oriented to higher-order thinking skills is expected to facilitate students in increasing their capacity for higher-level thinking. Questions that require higher-order thinking skills have already begun to be applied in the National Examination in the 2104/2015 school year and are increasingly being extended to the National Examination in 2018. This is expected to encourage the development of higher-order thinking. Student skills in Indonesia so that it becomes a competitive nation.

Various national and international studies show that high order thinking skills of students in Indonesia are still low. This was indicated by decline result of national examination the in 2018



compared to the results of the previous year. The decrease in the results of this National Examination was allegedly caused in 2018 student and teacher feel the question were more difficult than the previous years. The low order thinking skills of Indonesian students is also evident from the results of several international assessments. The results of the 2015 PISA (International Student Assessment Program) study in 2015 showed that Indonesian students were ranked 63rd out of 69 countries.

By adapting Realistic Mathematics Education (RME) with a concept to improve mathematics education in Indonesia which discusses how to improve students' understanding of mathematics and develop reasoning power. Learning with RME models is suitable or supportive high order thinking skill especially with subject and contextual learning (Suktinah, 2007: 20). Several studies on RME have been conducted at the primary or secondary school level showed increase high order thinking skill (Hadi, 2002; Fuadiah, 2009; Zulkardi, 2002; Haryono, 2011).

Therefore, this scientific study aims to develop teacher professionalism in HOTS and develop teaching materials that do apply HOTS. Of the several alternatives in the professional teacher enforcement of the Directorate General of Primary and Secondary Education of the Ministry of National Education (2005), researchers in develop teacher professionalism in the MGMP empowerment program in the East OKU district area. While the development of teaching materials used is Realistic Mathematics Education (RME), which has been shown to increase students' understanding of mathematics learning so as to enhance students' understanding of higher-order thinking skills. So that collaboration between the development of teacher professionalism and the development of teaching materials is expected to improve HOTS of Indonesian student.

Research Method

The Directorate General of Primary and Secondary Education of the Ministry of National Education (2005) follows several alternatives for the Teacher Professional Development Program, as follows:

1. Teacher Education Qualification Improvement Program
2. Equalization and Certification Program
3. Competency Based Integrated Training Program
4. Educational Supervision Program
5. MGMP Empowerment Program (Subject Teachers' Meeting).
6. Teacher symposium
7. Other traditional training programs
8. Read and write journals or scientific works
9. Participate in Scientific Meetings
10. Conduct research (specifically classroom action research)
11. Internship
12. Following the Actual News and Media News
13. Participating and Active in Professional Organizations
14. Promoting Collaboration with Peers

Of the several alternatives in the professional teacher enforcement of the Directorate General of Primary and Secondary Education of the Ministry of National Education (2005), researchers in develop teacher professionalism in the MGMP empowerment program in the East OKU district area for 20 hours. Because MGMP Empowerment Program (Subject Teachers' Meeting) covers five development models for teachers that is: Individual Guided Staff Development, Observation/Assessment, Involvement in a development/Improvement Process, Training, and Inquiry.

- a) Implementation methods and techniques used in the implementation of professional development of mathematics teachers in East OKU district by applying the principles of Andragogy include adding:
 - Brainstorming
 - Discussion
 - Work in group
 - Presentation

- Plenary
- b) Structure and Program

The professional development activities of mathematics teachers in OKU Regency are carried out with the following structures and programs:

 - 2013 curriculum policy (resource persons) 2 hours
 - 21st century concept of learning and renewal (resource person) 4 hours
 - Development of HOTS questions (Resource person) 3 Hours
 - HOTS Model (Resource Person) 2 Hours
 - Group work (Participants) 4 hours
 - Discussion / Percentage (Peseta) 4 Hours

The results obtained were tested by the participants in their respective education units and asked for help to validate the questions that have been generated and revised based on the expert/expert and retested.

Discussion

To achieve the objectives of this scientific study, researchers examine several important things that have proven to be able to develop teacher professionalism in HOTS and develop teaching materials in HOTS that are easily understood by students. But because this research is still ongoing researcher only can gather some research about the collaboration between the development of teacher professionalism and the development of teaching materials to improve HOTS of Indonesian students. Higher order thinking skill (HOTS) is one of the students' abilities that should be developed through teaching and learning. Teachers' knowledge about HOTS and its teaching and learning tactics is a key to successful education higher order thinking skill (HOTS) is one of the students' abilities that should be developed through teaching and learning. Teachers' knowledge about HOTS and its teaching and learning tactics is a key to successful education higher order thinking skill (HOTS) is one of the students' abilities that should be developed through teaching and learning. Teachers' knowledge about HOTS and its teaching and learning tactics is a key to successful education

According to Retnawati et al., 2018 higher order thinking skill (HOTS) is one of the students' abilities that should be developed through teaching and learning. Teachers' knowledge about HOTS and its teaching and learning tactics is a key to successful education. However, in implementing HOTS, the overall findings indicate that two-thirds of the teachers (66.6%) were still low-level users of HOTS. This is based on the teachers' response in the open-ended question that gave little evidence that they implement HOTS. This research has indicated that educational change depends on what teacher 'do' and 'think'. It is what the teachers believe and what teachers do in the classroom that ultimately shapes the kind of learning that students get (Hashim AT, et al 2015). So, from statement above develop, teacher professionalism in HOTS is very important.

Researcher choose MGMP empowerment program as teaching development professionalism method because MGMP Empowerment Program (Subject Teachers' Meeting) covers five development models for teachers that is: Individual Guided Staff Development, Observation/Assessment, Involvement in a development/Improvement Process, Training, and Inquiry (Table 1). So that, hopefully can increase teacher professionalism in HOTS.

Table 1. Teacher Development

Teacher Development Model	Information
Individual Guided Staff Development	Teachers can assess their learning needs and be able to learn well to direct themselves. Teachers must be motivated when aligning basic learning goals
Observation/Assessment	Observing and evaluating from teaching provides teachers with data that can be used for the purpose of improving student

Involvement in a development/Improvement Process	learning. Reflection by the teacher in practice can be enhanced by other observations Adult learning is more effective about solving problems to solve problems. Teachers need to gain knowledge or skills gained through the process of improving the school or curriculum.
Training	There are techniques and behaviors that are suitable for the teacher to emulate in the class. Teachers can change their behavior and learn to apply behavior in their classrooms.
Inquiry	Professional development is a collaborative studio by the teachers and problems that arise from efforts to make them disciplined with the values of the field of education.

Higher order thinking skill (HOTS) is one of the students' abilities that should be developed through teaching and learning. Teachers' knowledge about HOTS and its teaching and learning tactics is a key to successful education. However, in implementing HOTS, the overall findings indicate that two-thirds of the teachers (66.6%) were still low-level users of HOTS. This is based on the teachers' response in the open-ended question that gave little evidence that they implement HOTS. This research has indicated that educational change depends on what teacher 'do' and 'think'. It is what the teachers believe and what teachers do in the classroom that ultimately shapes the kind of learning that students get. High order thinking skills, history teaching, curriculum change, curriculum innovation

According to Zulkardi and Putri (2010), RME is a learning theory that starts from things that are real or experienced by students, supports the process of learning mathematics, discussing and collaborating, and finally using mathematics is to solve problems both individually and in groups. In this role, the teacher or moderator or evaluator while the role of students is more and actively thinking, communicating their arguments, justifying their answers, and also practicing their mind strategies. From the opinion of the experts above, it can be concluded that the RME in making the lesson more real, because the problem given is a contextual problem. In solving contextual problems students are guided by the teacher until they understand the mathematical concepts they are learning. For students, they are required to be more active in thinking, communicate their arguments, justify their answers, and prepare strategies to support their answers. So, from statement above we can conclude that RME can increase students 'understanding of mathematics learning so as to enhance students' understanding of higher-order thinking skills.

Conclusion

The results of this scientific study hopefully that the development of teacher professionalism can be done by increasing the professionalism of educators in developing and utilizing educational technology in the world of education. Professional educators can interpret the commitment to increase their professionalism and continuously develop strategies that they use in doing work in accordance with their profession. Educator can be achieved by deepening scientific field (cognitive) through postgraduate education, education and short-term training; improve psychomotor and affective abilities through training, workshops, seminars, discussions, academic and academic activities while developing teaching materials that are important for students, with high order thinking skills can be done using the RME approach it has been proven.

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