School Literary Movement in Indonesia: Challenges for Scientific Literacy

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Abstract: Reflections on the results of tests by PIRLS, TIMSS, PISA, encouraging the Ministry of Education and Culture, Indonesia, developed the Gerakan Literasi Sekolah (School Literary Movement). GLS aims to foster reading interest and reading skills of students. In the broader context GLS develop the school to serve as a learning organization that makes all citizens as a lifelong learner. Critical analysis of the GLS with the main program emphasizing reading skills is the first step to develop literacy which can serve as the basis development of scientific literacy. Scientific literacy is the goal of science education that need to be developed in the school. Scientific literacy has a significant role in encouraging every citizen to understand the nature of science, basic science knowledge and scientific thinking, so that they can actively participate in issues of science, technology and their impact. Critical reading, scientific writing, and scientific inquiry is a framework for development of a culture of scientific literacy. In the school literacy practices, critical reading, scientific writing, and scientific work through scientific inquiry integrated in science lesson.

Keywords: Gerakan Literasi Sekolah, scientific literacy, scientific inquiry.

The advancement in science and technology are rapid and has brought great changes in the world of education. The development education the 21st century, known as the century of knowledge and innovation-based economy, driven by advances in technology and science (Liliana & Florina, 2015). Every citizen should have the ability to use scientific literacy to make smart decisions with regard to issues involving science and technology. for that reason the scientific literacy is an important ability to understand for all.

In a world flooded with products of scientific inquiry, every citizen has the right to education of scientific literacy (Glynn & Muth, 1994). In today's information age demands mastery scientific literacy increased in the workplace. More jobs require high level skills, need people who are able to learn, to reason, to think creatively, make decisions, and solve problems related to global issues (Liu, 2009). In other words, understanding of science, including content, attitude, and scientific procedure is an essential skill.

Currently, many jobs require high-level skills, need people who are able to develop learning to learn, develop reasoning ability, thinking creatively, make decisions, and solve problems related to global issues (Liu, 2009). In other words, understanding of science, including content, attitude, thinking skills, and scientific procedure is an essential skill.

Scientific literary of society is one of the main goals of science education (Norris & Philips, 2003). In 2002, the United Nations declaring 2003 to 2012 as "the United Nations Literacy Decade". Resolution 56/116 puts literacy at the heart of lifelong education (UNESCO, 2006). Based on the UN resolution, many countries reformed science education with the aim to develop scientific literacy.

Science literacy in Indonesia have started to become the focus in education. Although, learning science is still focused on mastery of concepts and basic science process skills. Mastery of science concepts is not enough for the generation, they must harmonize mastery of science concepts with economic developments, technological developments, social case, and quality of

life (Hurd, 1998). Therefore it is necessary for education reforms to foster scientific literacy. Science education intended to foster scientific and technological literacy. The teaching and learning in school should be changed from teaching the motivation and needs of students to mastery science concept to learning of science that focuses on community problem and socio-science issues (Holbrook & Rannikmae 2009).

Indonesia's ranking in the PISA 2012 survey was 64 out of 65 countries. The results of the PISA assessment in previous years also showed a lower rank. These findings arouse Indonesian government through the ministry of education to cultivate literacy for all students. To promote literacy, the Ministry of Education and Culture to develop the Gerakan Literasi Sekolah (School Literary Movement). GLS is a comprehensive effort that involves all of the school community (teachers, students, parents) and the community, as part of the ecosystem of education (Kementerian Pendidikan dan Kebudayaan, 2016). The literacy movement should not only be interpreted as a motion of reading but it promotes the growing of high-level thinking skills through reading. Literary Movement Schools are expected to run with the correct meaning as an effort to foster literacy, including scientific literacy for future generations.

New Direction of Science Education

In the past decade educational institutions aware of the need for re-orientation of the purpose and process of teaching and learning. This policy aims to use education as a means to develop students into "creative thinker", "lifelong learners" and "change leaders". The two movements that are the focus of the policy is changing of teaching and learning process ie "teach less, learn more" and "innovation and enterprise". The key initiatives of the reorientation is emphasizing the use of innovative teaching approaches to engage students in learning (Lim & Pyvis, 2012).

Reorientation of the objectives and the learning process of science is based on the importance of educating students to prepare themselves for a successful life in the 21st century. In the future, students will live as adults many tasks (multitasking), many aspects (multifaceted), controlled by technology (technology driven), highly diverse and dynamic (vibrant). Therefore, instruction should be learn students to live in the information age; empower students to be able to use the knowledge and skills they already had to use today's technology to discover new things in the future; prepares students to be able to think for themselves, make informed decisions, develop expertise, and continuous lifelong learning. government and schools are responsible for building superior society, have a better quality of life, advanced economies, and able to compete for life in the digital age.

Education is expected to educate students to master the scientific literacy which is a competence that is used in the workplace in the 21st century. According NCREL and Metiri Group (2003) the literat competence owned by generations of the 21st century include academic skills, thinking skills, reasoning, collaboration and agility harness technology. Partnership for 21st Century Skills formulate 21st century skills into three general skills, namely 1) the skills related to information and communication; 2) thinking and problem solving skills; and 3) interpersonal skills and self-regulating skills. In another reference Partnership for 21st Century Skills in collaboration with the National Science Teachers Association (NSTA) describes the necessary 21st century skills necessary to students in the context of science education, such skills are creativity and innovation, critical thinking and problem solving, as well as literacy skills. Literacy skills that should be developed are scientific communication, collaboration, information literacy, media literacy, information and communication technology literacy, flexible and adaptive, self-initiative and self-directed to learn, have cross-cultural social skills, productive and accountable, as well as leadership and responsibility.

At this time the need for a professional in science and technology increased (mikser, Reiska, & Rohtla, 2008). It is important for Indonesia because the number of students interested in getting into the field of science is still high. An important goal of science education in schools is twofold. First, science education aims to educate and motivate students for a career as a scientist and expert in the field of science and technology. Second, science education aims to prepare all children to have knowledge and understanding of the world around them and prepare them to be citizens of informed science, and able to run effectively and make decisions about science issues that affect human life. We are committed to the vision of the 21st century knowledge and skills of scientific literacy for all. It is important for educators to master competencies that ensure positive learning outcomes for students (Partnership for 21st Century, 2010) include:

1. Align content and pedagogy with today's technology and develop the creative ability to use technology to meet the learning needs;
2. Aligning learning with the standards of knowledge and skills of the 21st century;
3. Balancing the direct teaching strategies with project oriented teaching,
4. Use a variety of assessment strategies to evaluate student performance (including formative / assessment for learning, portfolio, summative);
5. Participate actively in the learning community;
6. Acting as a mentor and coach with fellow peer educators;
7. Use a variety of strategies to serve a diverse student and create an environment that supports learning diferentiated;
8. Being a lifelong learner.

Teaching is not lecturing, studying instead of listening to lectures and taking notes. learning is constructing new experiences and knowledge. The ideal teacher understands how students learn and control all the factors that impact on the quality of students. All the variables that affect the outcome of learning is used as a basis to understand, choose, and determine approach to foster learning.

In the paradigm of the new education, traditional instructional approaches such as "lectures, drills, exercises", "one method for all students", "there is only one answer and the correct way" to be stopped in schools (Lim & Pyvis, 2012) , This approach was replaced by a progressive pedagogical approaches, such as collaborative learning and diferentiated learning as well as the use of ICT in teaching and learning.

Reorientation of Curriculum and Science Teaching

The science teacher has a central role in promoting science literacy education. National agenda 9 year basic education is the right program for the effort to foster scientific literacy. Therefore, reform of science education is done at school level as well as in science teacher education. Science teacher education curriculum was developed following the needs of 21st century learners curriculum is a framework that develops scientific literacy and the expected impact on the quality of graduates. Education Curriculum is not currently sufficient to provide the knowledge which is then stored and used in the future, education must help students learn so that they are able to manage the changing demands of technology, information, work, and social conditions (Barron & Chen, 2008).

Teacher is a typical profession related to the facilitation of the learning process. Failure of one teacher has a broad impact and across generations, which affects the life of society and nation. higher education teacher candidates has a mission to produce qualified teachers canddate, which is capable in performing the task of teaching and learning that are characterized by the ability to implement active learning, innovative learning, and joyfull learning or active

learning in school (ALIS). The educational process in higher education teacher candidate should be designed and developed based on the principles of active learning in higher education (ALIHE) or student-centered learning (SCL).

Basically teaching is to solve the problem, so that a teacher should be able to identify and solve problems in the classroom, including taking a decision. Teachers need to understand the development of professional knowledge about teaching and improve their teaching practices through reflection (reflection on practice) and views of other teachers. This includes thinking about teaching and learning from a variety of perspectives to develop an understanding of teaching and learning situation in depth (Loughran, Berry, & Mulhall, n.d.). Teacher education need to develop academic culture in the form of a process of reflection and problem-solving as a means undertaken to foster competence of the prospective teachers, for example through the lesson study.

Teacher education is also linked to the question "what science education is needed by young people today?", According to the NSTA (2009) science education today aims:

1. Preparing students for a career in science and technology (pre-professional training);
2. Equipping students with practical knowledge of how nature and objects work (utilitarian purpose);
3. Build scientific literacy of students to become literate people participated in information and understanding, explaining, and resolving the issue of science (democratic/ citizenship purpose).
4. Develop students' skills in scientific thinking, scientific understanding, scientific work as a means of civilizing the intellectual (*cultural/intellectual purpose*).

Naumescu (2008) and NSTA (2009) explains that the teacher must display practical teaching skills:

1. create new ideas in teaching science;
2. present the curriculum in an international perspective;
3. develop curiosity of students and appreciate different cultures;
4. have knowledge of the scientific capabilities of students (in accordance with the development of age);
5. have knowledge of a meaningful assessment;
6. integrate science, technology, environment and society in a global perspective;
7. understand and analyzed the issues in daily life;
8. open to inquiry and innovation;
9. adapt the science curriculum to the diverse interests and talents of students.

"What makes great teaching?" (Coe, Aloisi, Higgins, & Major, 2014) gives an answer that great teaching is effective teaching improve student achievement using indicators that are essential for success in the future. Variables that influence the effective teaching is as follows: Pedagogical content knowledge (Strong evidence of impact on student outcomes)

1. Quality of instruction (Strong evidence of impact on student outcomes)
2. Classroom climate (Moderate evidence of impact on student outcomes)
3. Classroom management (Moderate evidence of impact on student outcomes)
4. Teacher beliefs (Some evidence of impact on student outcomes)
5. Professional behaviours (Some evidence of impact on student outcomes).

In order to achieve the successful implementation of a new curriculum that supports progressive pedagogy, teachers must be proficient in three areas of professional competence: subject matter content knowledge; pedagogical knowledge; and pedagogical content knowledge (Chen, 2008). These three kinds of competencies are interrelated to one another. Teachers who have good content pedagogy understand the difficulties of learning related to the subject that the students might face. Science teacher who master the content will be able to choose the

content that is more effective in promoting high-level critical thinking skills through the "ask a question cognitively challenging" and "reduce misconceptions." Instead, teachers lack knowledge of content, pedagogical knowledge and pedagogical content knowledge will not be able to promote active learning in the classroom, and tend to teach with just repetition and memorization. It is known that the acquisition of new knowledge for innovative science teaching depends on personal factors and institutional (Davis, 2003). Therefore, the acquisition of pedagogical content knowledge toward quality science education becomes the main function of the teacher education institutions.

Scientific Literacy, Critical Reading, and Writing Critically

Scientific literacy is the ability to know the facts and the basic concepts of science and have an understanding of how science works (Yalcin, Acisli & Turgut, 2011). Scientific literacy is the ability to creatively utilize appropriate knowledge based on scientific evidence and scientific skills, especially related to daily life and career (Holbrook & Rannikmae, 2009). Laherto (2010) describes the scientific literacy as the ability to hold opinions and to make decisions about social issues related to science and technology.

Scientific literacy is also defined as the skills to use scientific knowledge in real situations and using evidence and data to evaluate the quality of information and scientific arguments (Dragos & Mih, 2015). Furthermore, the OECD (2003) explains that science literacy is the ability to use scientific knowledge to identify questions and to draw conclusions based on the evidence in order to understand and help make decisions about the natural world and the changes due through human activity. Science literacy dimension contains basic knowledge of scientific concepts and dimensions of the scientific process basing conclusions on evidence and scientific reasons (Hobson, 2008).

An individual can be said scitifically literat if the person understands the science, the nature of science (the attitude and the process of science) and its relationship with society and the environment (Turiman, Omar, Daud, & Osman, 2012). In practical activities, Toth & Graham (2015) explains that individuals who scitifically literat has the ability to evaluate a variety of news reports about the everyday problems with a critical attitude towards the information, which means using the values and norms and ideas based on evidence.

Scientific literacy is very important in the development of an educated society. Laugksch, 2000; Salamon, 2007; Foster & Shiel-Rolle, 2011) describes that there is a connection between science literacy and the economic prosperity of a nation. Country with citizens who scitifically literat that will have high competitiveness. In the individual level scientific literacy improve understanding of science and technology in a world dominated by science and technology (personal fulfillment and its relationship to daily life).

3Rs (Reading, Writing, and arithmetic) are the three basic skills are the foundation for the development of scientific literacy. Reading is a basic skill in the development of scientific literacy. Understanding the science text requires reading comprehension skills. Snow (2002) defines the skills of reading comprehension as a process of filtering and constructing meaning through interaction and involvement with written language (text or reading). Skills of reading comprehension is a complex task that describes a range of skills and processes (Oakhil & Cain, 2007) that requires technique, skills and cognitive abilities (Oakhil, Cain & Elbro, 2015). According to Magliano, Millis, Ozuru & McNamara (2007) reading comprehension is the result of a complex interaction between the wealth of text and what readers bring to reading situations.

Reading comprehension is an important precursor of critical reading. Critical reading is an important skill to support critical writing. Students who have the ability to read critically understand text that reads, capable of assessing an argument based on evidence and scientific

arguments, and able to take the decision to accept or reject the arguments, opinions and conclusions of the text being read. Critical reader will understand the meaning content of the sentence, the content of reading and also "beyond the line".

Critical reading is a collaboration between the reader and the writer. It offers the reader the ability to be an active participant in the construction of the meaning of the text they read and use meanings to meet her/his needs. Reading and writing are two separate activities, but both have a close relationship. Critical writing ability is the result of a critical reading.

The Challenge: Cultivating Scientific Literacy Of 21st Century Learners Through SCL

The scientific literacy of students can be foster by improving the learning process and create a learning environment that is safe, supportive, and comfortable for ongoing learner-centered learning. Student-centered learning (SCL) is a learning approach that puts the student as the main variable that determines the content, activities, materials and speed of learning. This teaching model puts students at the center of learning process. The instructor (lecturer, teacher) gives students the opportunity to learn independently and effectively. Independent learning is learning that is driven from yourself, including ideas, motivations, and intentions; and involves collaboration with teachers or other learners (McKendry & Boyd, 2012).

Traditional learning model is replaced by SCL approach with the intention of empowering experience active thinking, giving the task in the form of open-ended problems that require critical and creative thinking that can not be solved just by reading textbooks, including simulation and role playing, and cooperative learning (team- based learning). Implementation SCL can move the motivation to learn, strengthen retention of knowledge, deep understanding, and foster a positive attitude towards science (Froyd & Simpson, 2000).

Learning strategy to improve scientific literacy is constructed by combining reading, writing, berinkuiri, can be done with a few strategies are as follows.

1. Teaching by using problem-based learning and inquiry-based learning (Salamon, 2007), with emphasis on the process of investigation that combines the knowledge understanding and mastery the strategies to solve everyday problems (Oluwatelure, 2012).
2. Designing a curriculum that develops knowledge of science, the nature of science, and the application of science in technology and its impact on the environment and society (Sothayapetch, Lavonen & Juuti, 2013).
3. Contextual learning strategy that balances learning activities inside and outside the classroom (West, Hopper &Hamil, 2010).
4. Designed an integrative learning pedagogical approaches include discussions, scientific inquiry, scientific writing, and argumentation (Villanueva, 2010).

Inquiry is believed to be one of the teaching strategies that are beneficial to develop scientific literacy. Inquiry is an investigative process that begins with the identification problem, formulating hypothesis, testing of hypothesis, data collection, and the formulation of conclusions (Trowbridge & Bybee, 1990). Scientific inquiry refers to the work of scientists who study nature and provide explanations based on evidence (Banerjee, 2010). Inquiry has been proposed as a primary strategy for teaching science (National Research Council, 1996; Tan & Kim 2012). Inquiry is able to improve student achievement, especially in the aspect of problem-solving skills, the ability to explain the data, critical thinking, and understanding of concepts in science learning (Chang, Sung & Lee, 2003). In science learning, inquiry and experience of students in the classroom should be combined so as to allow students to use scientific reasoning and critical thinking to develop their understanding of science (Banerjee, 2010), and develop problem solving skills (Trna, Trnova & Sibor, 2012). The essence of inquiry learning is to

manage the condition or the learning environment of students with enough guidance to find scientific concepts and principles (Trowbridge & Bybee, 1990).

Conclusion

The purpose of science education is to prepare students as prospective professionals in science and technology and foster science literacy of the 21st century for all citizens. Critical reading, scientific writing, and scientific inquiry is a framework for development of a culture of scientific literacy. Inquiry is believed to be one of the teaching strategies that are beneficial to develop scientific literacy. In the school literacy practices, critical reading, scientific writing, and scientific work through scientific inquiry integrated in science lesson.

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