

Important Roles of Local Potency Based Science Learning to Support the 21st Century Learning

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Abstract

The development of scientific knowledge and technology, including education have reached the 21st century. In this century, education is not only functioned to develop technology-based learning but also environment-based learning. To meet the challenge, some researchers concentrating on scientific education have developed and implemented local potency based science learning. The researchers systematically reviewed several literatures of relevant research and concluded that local potency based science learning has important roles in the 21st century learning. The learning is able to improve students' abilities obligated by the 21st century learning that are: learning and innovation skills, digital literacy skills, and career and life skills.

Keywords: science learning, local potency, 21st century learning, 21st century skills

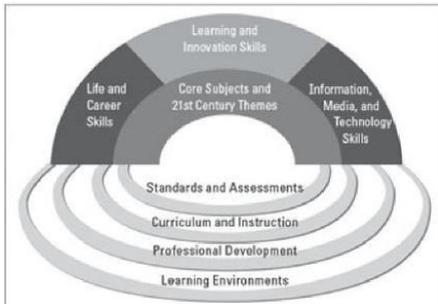
Introduction

The 21st Century Learning

Education is widely perceived as a solution to solve social problems. Education cannot be separated from learning systems given by schools. A correct learning is a strong base to create qualified human resources. Education is one aspect influenced by the era development. The influence gives direct impacts on the society. In this era, learning has reached the 21st century learning. It is notified that there are important roles of education in the 21st century. Trilling & Fadel (2009) argue that the roles are to give contribution in both working world and society, to facilitate students to

enhance their skills, to fulfill societal responsibility, and to preserve social cultures and values.

Picture 1 The framework of 21st Learning



The 21st century learning is not merely about teachers transforming knowledge to students but also guiding them to optimize their knowledge and skills. This optimization is expected to make them become globally competitive and able to solve any social problems. In his book titled 21st Century Skills, Kay (2010) conveys the framework of 21st century learning that is:

Based on the framework, there are main subjects and themes of 21st century learning that are art, economics, science, geography, history, government and civics, mathematics, art, world language, English, reading and language arts. There are three skills becoming the focus of 21st century learning: information, media, and technology skills, learning and innovation skills, and life and career skills (Alismail & Mcguire, 2015) Furthermore, Saavedra & Opfer (2015) explain that students have to master seven skills in order to be able to survive and compete with others in the 21st century. Those seven skills are:

- Critical thinking and problem solving
- Collaboration and leadership
- Flexibility and adaptability
- Entrepreneur and initiation
- Written or oral communication
- Information accessibility
- High curiosity and imagination

Science Learning

Learning is an interaction process between students and teachers as well as an interaction process between students and all supportive learning sources to achieve desirable results (Abdullah, 2012). A scientific investigation occurs during a

learning process. Hempel (2004) divides the branches of this scientific investigation into two big groups: empirical and non-empirical science. One of key learning or theme of 21st century learning is science, a branch of scientific knowledge whose role is to advance both scientific knowledge itself and technology.

Mohan (2007) explains that there are three essences of science learning: a body of knowledge, a way of investigation, and a way of thinking in pursuit of an understanding of nature. Yager & McCormack (1992) regard five domains of science as an expansion, development, and deepening of three domains of Bloom's taxonomy. Those five domains are knowledge/concept domain, process of science domain, creativity domain, attitude domain, and application and connection domain.

Local Potency Based Science Learning

To improve the qualities of education and human resources, education in Indonesia should maintain social contacts and kinship and encourage cooperation and awareness of social, cultural, ethic, and moral values. Hence, employing technology in education has to be in accordance with educational necessities of Indonesia. One learning method suitable to be implemented in scientific learning is local-potency-based science learning.

Parmin, Sajidan, Ashadi, & Sutikno (2015) argue that local potencies are uniqueness owned by a certain area. Physical environment such as variations of floras and faunas as well as sociocultural aspects such as utilization of simple technology are two examples of local potencies. National Education Standardization Energy (2006) defines local-and-global-potency-based education as an education utilizing local potencies and demands of global competitiveness in aspects of economy, culture, language, information-technology, communication, ecology, etc.

(Alismail & Mcguire, 2015) explain that local-potency-based learning is one approach of science learning. Science enables students to study natural phenomena without losing any faith to God so that students are aware of obligation to maintain a good relationship with God, human, and environment (Dewi, Kristiantari, Negara, & Oka, 2014). local potency based science learning can improve students' scientific skills because the learning is implemented through processes of observation, discussion, presentation, and practices (Atmojo, 2015).

Important Roles of Local Potency Based Science Learning

To observe significant roles of local potency based science learning to support the 21st century learning, the researchers systematically reviewed literatures of

various journals related to local potency based or local wisdom based science learning. The results are presented in Table 1.

No	Researcher and Research Title	Research Purposes	Research Variable		Research Method	Result of Research
			Dependent	Independent		
1.	Suastra (2010) "Local Wisdom Based Science Learning Model to Develop Science Basic Competence and Local Wisdom Value in Junior High School"	The aim of this research is doing need assesment or student in the science learning at junior high school student and will be reference to design local wisdom based science learning model to develop science basic competence and local wisdom value in junior high school.	science basic competence Local wisdom value in junior high school	local wisdom based science learning model	Research and Development (R&D)	In the class VII and VIII there are 11 standard competence can develop in the local wisdom based science learning model The suitable method is used for local culture-based science learning is an investigation / experiment, field observation, and discussion. A suitable learning resource to support science learning is the natural environment and socio-cultural, textbooks, audio-visual, and internet Design Appropriate learning developed includes steps: initial activity, investigation from various perspectives (exploration), elaboration, confirmation, end activities.
2.	Mungmachon (2012) "Knowledge and Local Wisdom: Community Treasure"	The aim of this research is identification environmental problem and social community and to known the role of knowledge and local wisdom to overcome this problem	Knowledge Local wisdom	Social and environmental problems	Study case	Globalization era gives negative effect in community. The findings show many environmental and social problems. In an effort to overcome this problem, various communities began to restore local wisdom and traditional knowledge remaining, and integrate it with new knowledge

No	Researcher and Research Title	Research Purposes	Research Variable		Research Method	Result of Research
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.	Santoso, Sajidan & Sudarisman, (2013) "Implementa- tion Science Technology Society Model Through Field Experiments and Laboratories Methods Reviewed By Attitude of Environmental Care and Student's Verbal Creativity"	The aim of this research is determining the effect of Science Technology Society learning model through field experiments and laboratories methods, between students who have an attitude of environmental care and verbal creativity in high and low categories of students' biology learning achievements, and their interactions	Environmen- tal care attitude Student's verbal creativity	Science technology society models	True experiment	There are influence field experiments and laboratories methods toward cognitive learning achievement, affective and psychomotor student There are influence attitude of environmental care toward cognitive learning achievement, affective and psychomotor student There are influence verbal creativity toward cognitive learning achievement, affective and psychomotor student There are interaction between method and attitude of environmental care toward cognitive learning achievement, affective and psychomotor student There is no interaction between method and creativity toward cognitive learning achievement, affective and psychomotor student There are interaction between attitude of enviroenmetal care and verbal creativity toward cognitive learning achievement, affective and psychomotor There is no interaction between method, attitude of enviroenmetal care and verbal creativity toward cognitive learning achievement, affective and psychomotor student
4.	Khusniati, (2014)	The aim of this research is	conservation character of	science learning model	Literature Review	science-based learning model local wisdom can

No	Researcher and Research Title	Research Purposes	Research Variable		Research Method	Result of Research
			Dependent	Independent		
	"Science Learning Model Based on Local Wisdom In Growing Character of Conservation"	identification role of science learning model based on local wisdom in growing conservation character of student	student	based on local wisdom		be utilized to deepen the concept of science so as to foster the conservation character of student
5.	Atmojo (2015) "Learning Which Oriented On Local Wisdom To Grow a Positive Appreciation of Batik Jumputan (Ikat Celup Method)"	The aim of this research is to identify science materials in the batik jumputan process as a local culture. With knowing By knowing the existence of element of science in batik jumputan, expected to grow positive appreciation to batik jumputan as local cultural heritage	Science process skills Appreciation	Learning which oriented on local wisdom of batik jumputan (ikat celup method)	Experiment	There are enhancement appreciation after and before learning of making batik jumputan process with the criteria 0,70 g (High criterion) Average score of science process skills in the making batik jumputan process is 60% KPS 80% (High category).
6.	Setiawan & Wilujeng (2016) "The Development of Scientific-Approach-Based Learning Instruments Integrated With Red Onion Farming Potency In Brebes Indonesia"	The aim of this research is development of scientific- approach-based learning tool integrated with red onion farming potency feasible to improve science process skills and cognitive learning outcomes students	Science process skills Cognitive learning outcomes	Scientific-approach- based learning tool integrated with red onion farming potency	Research and Development (R&D)	Realization of scientific-approach-based learning tool integrated with red onion farming potency feasible to improve science process skills and cognitive learning outcomes students This learning tool effective to improve science process skills with gained scores is 0,54 (medium category) This learning tool effective to improve cognitive learning outcomes students with gained scores is 0,50 (medium category)
7.	Sya'ban & Wilujeng (2016) "Developing of Essence and Energy SSP Based on Local Wisdom to Improve Literacy Science and	The aim of this research is developing of SSP based on local wisdom to improve literacy science and environmental care of students	Science literacy Environmental care	Science specific pedagogy (SSP) based on local wisdom	Research and Development (R&D)	Realization of SSP based on local wisdom to Improve literacy science and environmental care Of students of MTs" with category "very good" Based on Hotelling's T2 test concluded SSP

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	Environmental Care Of Students of MTs"	of MTs"				based on local wisdom effective to improve literacy science and environmental care of students of MTs" with the significance value is $0,000 < 0,05$.
8.	Setiawan, Innatesari, Sabtiawan & Sudarmin (2017) "The Development of Local Wisdom-Based Natural Science Module To Improve Science Literation of Students"	The aim of this research is development natural science module based local wisdom with the theme is "kelud eruption" to improve science literacy student	Science literacy	Local wisdom-based natural science module	Research and Development (R&D)	Natural science module based local wisdom effective to improve science literacy student with the validation result are: components of material feasibility is 87, 5% (very good) components of presentation feasibility is 91,7% (very good) components of language is 88, 9% (very good) components of local wisdom is 87, 5% (very good) components of science literacy feasibility is 88,9% (very good)
9.	Dwiyanto, Wilujeng, Prasetyo & Suryadarma (2017) "Development of Science Domain Based Learning Tool Which is Integrated with Local Wisdom to Improve Science Process Skill and Scientific Attitude"	The aim of this research is: Developing of Learning tool based science domain integrated with local wisdom especially for science learning material "Object Change Around Us" for students grade VII of Junior High School Measuring the effectiveness learning tool based science domain integrated with local wisdom to improve science process skill and scientific attitude	Science process skill Scientific attitude	Learning tool based science domain integrated with local wisdom	Research and Development (R&D)	Realization of learning tool based science domain integrated with local wisdom feasible for science learning material "Object Change Around Us" for students grade VII of Junior High School Learning tool based science domain integrated with local wisdom effective to improve science process skill and scientific attitude of students grade VII of Junior High School.

No	Researcher and Research Title	Research Purposes	Research Variable		Research Method	Result of Research
			Dependent	Independent		
		of students grade VII of Junior High School.				
10.	Kumiati, Wilujeng, Prasetyo & Suryadarma (2017) "The Effectiveness of Science Domain-based Science Learning Integrated With Local Potency"	The aim of this research is to know the influence of science domain-based science learning integrated with local potency to improve science process skills student	Science process skills	science domain-based science learning integrated with local potential	Quasi Experiment	Science domain-based science learning integrated with local potency effective to improve science process skills student with the gain score is 0,67 (medium category)
11.	Dewi, Suryadarma, Wilujeng & Wahyuningsih (2017) "The Effect of Science Learning Integrated With Local Potential of Wood Carving and Pottery Towards The Junior High School Students' Critical Thinking Skills"	The aim of this research is to know effectiveness science learning integrated with local potential of wood carving and pottery to improve the junior high school students' critical thinking skills"	Critical thinking skills	Science learning integrated with local potential of wood carving and pottery	Quasi Experiment	Science learning integrated with local potential of wood carving and pottery effective to improve critical thinking skills of junior high school students with the significance value is 0.008 (significance <0.05)
12.	Rahardini, Suryadarma, Wilujeng (2017) The Effect of Science Learning Integrated With Local Potential To Improve Science Process Skills	The aim of this research is knowing the effectiveness of science learning integrated with local potential to improve science process skills	Science process skills	Science learning integrated with local potential	Quasi Experiment	Science learning integrated with local potential effective to improve science process skills with the gain score is 0,63 (medium category).
13.	Cahyaningtyas, Wilujeng & Suryadarma (2017) "The Effect of Science Learning Based Scientific Approach"	The aim of this research is knowing the effectiveness of science learning based scientific approach	Science process skill	Science learning based on scientific approach integrated to local potential	Quasi experiment	Science learning based scientific approach integrated local potential effective to improve science process skill with the significance

No	Researcher and Research Title	Research Purposes	Research Variable		Research Method	Result of Research
			Dependent	Independent		
	On An Integrated Scientific Approach To Local Potential On The Science Process Skill Of The Student"	integrated local potential to improve science process skill of the student"				value 0,001 (significance < 0,05)
14.	Susanti, Prasetyo & Wilujeng (2017) "Comparative Effectiveness of Science Integrated Learning Local Potential Essential Oil Clove Leaves in Improving Science Generic Skills"	The aim of this research is measuring effectiveness of science integrated learning local potential of essential oil clove leaves in improving science generic skills	Science generic skills	science integrated learning local potential of essential oil clove leaves	Quasi experiment	Science integrated learning local potential of essential oil clove leaves effective to improve science generic skills with the significant value is 0,000 Science integrated learning local potential of essential oil clove leaves more effective to improve science generic skills students of junior high school 3 ngaglik than students of junior high school piri ngaglik with the significant value is 0,000
15.	Wilujeng, Prasetyo & Suryadarma (2017) "Science Learning Based on Local Potential: Overview of The Nature of Science (NoS) Achieved"	The aim of this research is to know effectiveness of science learning based on local potential: overview of the nature of science (NoS) achieved"	Nature of science (NOS) achievement	Science learning based on local potential	Experiment	Science learning based on local potential effective to improve Nature of Science (NOS) viewed by science process skill and scientific attitude junior high school student especially class of VII and VIII

Learning based on local potential is one of approach that utilizes various potentials that exist in certain areas as a source of science learning. These local potentials include: economics, culture, language, information and communication technology, ecology, diversity of flora and fauna, products with the use of simple technology and others.

Based on the findings of several studies, it appears that this learning can improve the various abilities of student. Not only improve knowledge but be able to improve skills even give effect to the attitude of student. Increasing knowledge related to the concept of science is the obligation of a teacher to the students. This is because identical knowledge with the teacher managed to direct students to think and understand the concept. Based on the results of the literature review indicates that local potential based science learning is effective for improving students' knowledge.

In addition to knowledge, one of the other aspects that can be improved from this learning is students' science process skills. The enhanced skills of the science process include: observing, classifying, interpreting data, communicating, measuring, describing, conducting the experiment correctly, controlling variables, defining, formulating hypotheses, interpreting data, conducting investigations, selecting experiments, formulating models and the others.

Through learning based on local potential of course to train students to observe directly, make observations, find various problems and finally through communication students can give each other solutions related problems that exist. This step then gives a positive aspect to the changing attitude of students because students are invited to be logical, critical and reasonable to the various problems that exist.

One of the students' attitudes that have been improved from local potential-based science learning is environmental care. This attitude is certainly required by all students so that students better understand the various local potentials in their area and jointly maintain, preserve and appreciate various local potential as a natural heritage. Because this learning can increase knowledge, attitude, and skill it can be said that this learning can increase science literacy and the achievement of nature of science (NOS).

Kay (2010) describe skills involved in those big three skills focused in the 21st learning that are: *Learning and innovation skills; Information, media, and technology skills; and Life and career skills*. Components from this skills, namely:

Learning and innovation skills Critical thinking and problem solving
Communications and collaboration
Creativity and innovation

Information, media, and technology skills

Information literacy

Life and career skills

Initiative and self-direction

Social and cross-cultural interaction
Leadership and responsibility

Observed from the perspective of those focused skills and compared to achievements of local-potency-based science learning including scientific

processing skills, scientific generic skill, scientific literacy, knowledge, scientific attitude, cognitive learning outcomes, and creativity skill; it can be concluded that science learning integrated by local potencies holds important roles in the 21st century learning.

Beside to teach skills obliged by the 21st century learning, local-potency-based science learning is also expected to solve problems of science learning itself. Recent realities related to science learning can be observed on the report of OECD (2017) reporting that the study result of Program International for Student Assessment (PISA) in 2015 displayed Indonesian students' mastery in science reached the score of 403 only. It indicates that the mastery of science of junior high school students in Indonesia is still categorized as low. Such category illustrates the reality that students' scientific knowledge is still basic; whereas the expectation demands students to be able to reach the high order thinking ability.

Beside PISA, similar results are also shown by the result of survey conducted by Trends in Mathematics and Science Study (TIMSS) in 2015 that measured both scientific and mathematical skills of fourth and eighth graders. Indonesia was able to reach the average score of 397 and ranked as the 45th of 48 countries participating in TIMSS with the category of Low International Benchmark (IEA, 2017).

Based on the result of the report, it is expected that local-potency-based science learning can improve students' international achievements. Observed from the perspective of research result, local-potency-based science learning is effective to improve various skills obliged by the 21st century learning.

Conclusion

Based on studies on relevant research discussing local-potency-based science learning, it can be concluded this approach can approve scientific processing skills, scientific generic skill, scientific literacy, knowledge, scientific attitude, **cognitive learning outcomes, and creativity skill**. From this data show that this learning is effective and able to meet the 21st century skills demands that have to be fulfilled by the students in the 21st century learning.

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References

- [1] Abdullah, R. (2012). Pembelajaran Berbasis Pemanfaatan Sumber Belajar (Learning Based Use Of Learning Resources). *Jurnal Ilmiah DIDAKTIKA* Vol. XII(2), 216–231.
- [2] Alismail, H. A., & Mcguire, P. (2015). 21 st Century Standards and Curriculum : Current Research and Practice. *Journal of Education and Practice*. ISSN 2222-1735 (Paper) ISSN 2222-288X (Online) Vol.6, No.6, 2015. www.iiste.org
- [3] Cahyaningtyas, R.N., Wilujeng,I.,& Suryadarma, I.G.P. (2017). The Effect of Science Learning Based On An Integrated Scientific Approach To Local Potential On The Science Process Skill of The Student. *USEJ* 6 (2) (2017). <http://journal.unnes.ac.id/sju/index.php/usej>
- [4] Dewi, N. W., Kristiantari, B. S., Negara, M. G. R., & Oka, I. G. A. (2014). Thematic Model Nuance of Local Wisdom Assisted by Animation Media Affects Students' Science Learning Outcomes of Class III Elementary School Gugus Kaptan Japa. *Jurnal Mimbar PGSD Universitas Pendidikan Ganesha Jurusan PGSD* (Vol: 2 No: 1 Tahun 2014).
- [5] Dewi, I. P. M. , Suryadarma, I.G.P., Wilujeng,I.,& Wahyuningsih, S. (2017). The Effect of Science Learning Integrated With Local Potential of Wood Carving and Pottery Towards The Junior High School Students' Critical Thinking Skills. *Jurnal Pendidikan IPA Indonesia (JPII)* 6 (1) (2017) 103-109. <http://journal.unnes.ac.id/index.php/jpii>
- [6] Dwianto,A.,Wilujeng,I., Prasetyo, Z.K., & Suryadarma, I.G.P. (2017). The Development of Science Domain Based Learning Tool Which Is Integrated With Local Wisdom To Improve Science Process Skill and Scientific Attitude. *Jurnal Pendidikan IPA Indonesia (JPII)* 6 (1) (2017) 23-31. <http://journal.unnes.ac.id/index.php/jpii>
- [7] Hempel, G. C.(2004). *Pengantar Filsafat Ilmu Alam*. Yogyakarta: Pustaka Pelajar Offset.
- [8] Kay, Ken. (2010). *21st Century Skills: Why The Matter, What They Are and How We Get There* in Bellanca, J
- [9] & Brandt Ron (Eds.) *21st Century Skills: Rethinking How Student Learn*. North Morton Street. Solution Tree Press.
- [10] Kurniati, A.P, Wilujeng,I., Prasetyo, Z.K., & Suryadarma, I.G.P. (2017). The Effectiveness of Science Domain- Based Science Learning Integrated With Local Potency. *AIP Conference Proceedings* 1868, 080001 (2017); doi: 10.1063/1.4995185.

- [11] Mohan, R. (2007). *Innovative Science Teaching*. New Delhi: Prentice-Hall of India Private Limited.
- [12] Mungmachon, R. (2012). *Knowledge and Local Wisdom: Community Treasure Miss Roikhwaphut Mungmachon PhD Candidate in Integral Development Studies*, 2(13), 174–181.
- [13] National Education Standardization Energy (2006). *Panduan Penyusunan Kurikulum Tingkat Satuan Pendidikan Jenjang Pendidikan Dasar dan Menengah*. Website: <http://bsnp-indonesia.org>
- [14] Parmin, Sajidan, Ashadi & Sutikno (2015). *Skill Of Prospective Teacher In Integrating The Concept Of Science With Local Wisdom Model*. *Jurnal Pendidikan IPA Indonesia (JPII)* 4 (2) (2015) 120-126.
- [15] Rahardini, R.R.B., Suryadarma, I.G.P., Wilujeng, I. (2017). *The Effect of Science Learning Integrated With Local Potential To Improve Science Process Skills*. *AIP Conference Proceedings* 1868, 080008 (2017); doi: 10.1063/1.4995192.
- [16] Saavedra, A. E & Opfer, V.D. (2015). *Learning 21st Century Skills Requires 21st Century Teaching*. New York: Bobst Library, New York University.
- [17] Santoso, Sajidan, A. M., & Sudarisman, S. (2013). *Penerapan Model Science Technology Society Melalui Eksperimen Lapangan Dan Eksperimen Laboratorium Ditinjau Dari Sikap Peduli Lingkungan Dan Kreativitas Verbal Siswa*, *Jurnal inkuiri* ISSN: 2252-7893, Vol 2, No 3 2013 (hal 204-215). <http://jurnal.fkip.uns.ac.id/index.php/sains>.
- [18] Setiawan, B., Innatesari, D. K., Sabtiawan, W. B., Sudarmin (2017). *The Development of Local Wisdom-Based Natural Science Module To Improve Science Literation of students*. *Jurnal Pendidikan IPA Indonesia (JPII)* 6(1), 49–54. <http://journal.unnes.ac.id/index.php/jpii>.
- [19] Setiawan, D., & Wilujeng, I. (2016). *The Development of Scientific-Approach-Based Learning Instruments Integrated With Red Onion Farming Potency In Brebes Indonesia*. *Jurnal Pendidikan IPA Indonesia (JPII)* 5
- [20] (2016) 22-30. <http://journal.unnes.ac.id/index.php/jpii>
- [21] Suastra, W.I. (2010). *Model Pembelajaran Sains Berbasis Budaya Lokal Untuk Mengembangkan Kompetensi Dasar Sains dan Nilai Kearifan Lokal Di SMP (Local Wisdom Based Science Learning Model to Develop Science Basic Competence and Local Wisdom Value in Junior High School)*. *Jurnal Pendidikan dan Pengajaran*, Jilid 43, Nomor 2, April 2010, hlm. 8-16.
- [22] Susanti, Prasetyo, Z.K., & Wilujeng, I. (2017). *Comparative Effectiveness of Science Integrated Learning Local Potential of Essential Oil Clove Leaves in Improving Science Generic Skills*. *International Journal of Environmental & Science Education* 2017, vol. 11, no. 8, 1817-1827.

- [23] Sya'ban, M. F., & Wilujeng, I. (2016). Pengembangan SSP Zat dan Energi Berbasis Keunggulan Lokal untuk Meningkatkan Literasi Sains dan Kepedulian Lingkungan (Developing of Essence and Energy SSP Based on Local Wisdom to Improve Literacy Science and Environmental Care Of Students of MTs). *Jurnal Inovasi Pendidikan IPA*, 2 (1), 2016, 66-75. <https://journal.uny.ac.id/index.php/jipi>
- [24] Trilling, B & Fadel, C. (2009). *21st Century Skills: Learning For Life In Our Times*. San Fransisco: Jossey-Bass. [23] Wilujeng, I., Prasetyo, Z.K., & Suryadarma, I.G.P. (2017). Science Learning Based on Local Potential: Overview of The Nature of Science (NoS) Achieved. *AIP Conference Proceedings* 1868, 080005 (2017); doi: 10.1063/1.4995189.
- [25] Yager, R & McCormack. (1992). *The Status of Science - Technology - Society Reform Efforts around the World*. USA: International Council Of Associations For Science Education.