

# INTERNALIZATION OF CHARACTER IN NATURAL SCIENCE LEARNING AS A PRESERVATION OF LOCAL WISDOM AND STRATEGY IMPROVING GLOBAL COMPETITIVENESS

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## ABSTRACT

Growing up of science, technology, and phenomena in the global era becomes the challenge of the Indonesian nation in maintaining local wisdom. Elements of local wisdom contain the values of cultural excellence of the community associated with environmental conditions, so it needs to be integrated in learning in the form of character education. Integrating character in science learning, it is necessary to balance the four dimensions of science, that is: ways of thinking, ways of inquiry, knowledge, and science-technology-society. The science learning process should optimize the ways of thinking and the ways of inquiry to develop thinking skills and thinking strategies. Local wisdom can be optimized through Science Technology Society and Environment based learning. Implementation of the reference of international standards of science learning is expected to graduate Indonesian students able to face global competition.

Keywords: character education, local wisdom, natural science learning

## INTRODUCTION

Currently entering the 21<sup>st</sup> century has felt the progress of science and technology increasingly rapidly. Entering in the global era as it is now the process of development can not be avoided by the Indonesian nation. In fact all the nations of the world are bound in intercorrelation in all spheres of life in a system that is developed worldwide. This will threaten the socio-cultural system of the nation of Indonesia which began to participate controlled in a system of modern culture is very favored innovation and technology advances. Thomas Friedman's statement (2006) in his book *The World is Flat* quoted by Pulubuhu (2014) explains that the globalization of the current period comes in the form of world uniformity in a flat order both physically and culturally. The statement indicates that the world without borders is flat, thus providing an opportunity for anyone to enter the competition. This is a challenge Indonesian nation today.

Along with the times, the Indonesian nation has not yet pointed to the existence of cultural and cultural values. Until now Indonesia is not optimal in the effort to build the character of the nation and state, even every time we can witness the various actions of society that result in the destruction of a nation. These behaviors include: (1) increased violence among adolescents, (2) decline in politeness behavior, (3) decline in honesty behavior, (4) decreased sense of togetherness and mutual cooperation, (5) increased self-destructive behavior, and (6) increasingly vague of moral guidance.

This decline of Indonesian character pushed the government to evaluate the process of curriculum implementation in schools. Policy makers are trying to find the best solution to solve the problem. To minimize the character problems that hit the Indonesian nation through education with curriculum renewal. The 2013 Curriculum is designed with the aim of preparing the intelligent and competitive Indonesians. Intelligent in this case is spiritual intelligent, social/emotional intelligent, intellectual intelligent, and kinesthetic intelligent (Mendikbud, 2013: 82). Purwanti (2013) suggests that the science learning process should refer to and apply the educational standards set by the government to equip students with body of knowledge (content standards); scientific skills, thinking skills, and strategy of thinking (process standards); critical and creative thinking (scientific inquiry standards); and authentic assessment (assessment standards).

The linkage of global challenges with the achievement of the 2013 Curriculum is to produce graduates who have competitiveness in the global world by improving the quality of education and mastery of science technology and art. The quality of good graduates is not only about skills, but also must have

superior character such as: independent nation mentality, innovative, creative, and professionalism. This can be achieved if the implementation of the 2013 Curriculum can be implemented effectively.

Humans who can answer the global challenge are people who have a strategy of thinking. Strategy of thinking arises when human beings have knowledge of science knowledge, able to reason as an integration of critical and creative thinking skills. The basic thinking strategy is conceptualization, where human beings make connections between concepts they have learned, so learning always interconnects between initial knowledge and new knowledge. The second thought strategy is to make decisions, in which people select solutions from many alternatives based on specific criteria for specific purposes. The third thought strategy is to solve problems, where people find solutions to every challenge faced in unknown lives or situations.

Thinking skills and thinking strategies have a strategic position to strengthen the nation's character. Character and cultural values when well developed it will be able to minimize social diseases of the community. In the current era of globalization, all aspects of life are open and uncontrollable and lack of filtering and the condition of society that is not ready to lead the people of Indonesia brought the flow of freedom that is more oriented to individualism and materialism and began to forget the local culture. Therefore, it is necessary to transform the values of local wisdom for the development of the character of the nation so that the Indonesian nation is able to maintain the nation's culture, as well as able to carry out consensus deliberations, cooperation or mutual cooperation as an effort to maintain the cultural heritage (Yunus, 2014: 6).

The values of local Indonesian wisdom are contained in the values and scientific attitudes of science learning. The international benchmark of the quality of science education explains the science literacy that provides an overview of the concept of science literacy and how science literacy is measured. Based on research results inform that the level of science literacy in Indonesia is still low, the achievement of science literacy learners not as expected. This is because the tendency in the field shows that: (1) science learning is only to master some knowledge as a science product (memorize concept, principle, law, and theory); (2) does not provide enough space to grow scientific attitude, practice problem-solving process, and application of science in the real life, (3) test-oriented learning (perception effect on high stake test), so that learning for the success of the national exam, (4) natural science as an attitude, process, and application not applied in learning, 5) learning more oriented to basic learning (learning for mastery of the concept), 6) not to applied learning (learning based on real problems).

This will not happen if the natural science is implemented by understanding the various phenomena of nature systematically include: scientific attitude, scientific process (scientific method), natural science product, and natural science application. Natural science learning by integrating character education can be a medium to maintain local wisdom. In addition, the application of standards in natural science learning will enhance the global competitiveness of the graduates produced. Therefore, the purpose of this study is to know the realization of character through science learning by maintaining the principle of preserving local wisdom and still not lose in global competition.

## **DISCUSSION**

### **Character building**

The foundation of character education is contained in Law Number 20 Year 2003. In Law Number 20 of 2003 on the National Education System it is mentioned that the curriculum is developed with the principle of diversification in accordance with educational units, regional potentials, and learners. This is intended to enable the adjustment of educational programs in educational units with the conditions and uniqueness of the potential that exists in each region.

The application of character integration in the academic field is poured in the curriculum with the aim to give good decisions, maintain good and realize goodness in everyday life. The 2013 Curriculum contains four core competencies of religious, social, knowledge, and skill competencies (Mendikbud, 2014). Based on these four competencies, religious competence and social competence represent the character development of the students during the learning process.

Implementation of character building in schools should be integrated in learning. The 2013 Curriculum is also expected to be well implemented, thus forming a strong character for students. Characters that can be developed include: (1) creative, Jones & Wyse (2013: 1) to define creative is "*creativity means a person's capacity to produce new ideas, insights, being of scientific, aesthetics, social, or technological value*"; (2) friendly, Kail and Cavanaugh (2013: 266) explains "*friendship is a voluntary relationship between two people involving mutual liking*"; (3) honesty, Bundu (2006: 41) states that "*honesty has a close relationship with respect for facts and data found (respect for evidence)*"; (4) responsibility, Cornerstone Values (Galloway, 2008: 18) states that "*responsibility is concerned with the ability/courage to be responsible for mistakes, to be trusted, and to be responsible for oneself and the group*".

Character education should be a national commitment in the form of character and cultural education that is an integral part of national education, comprehensive development and the need for a national movement. In accordance with Qodriyah & Wangid's statement (2015: 179) that integrating value education (character) in each lesson becomes very important for student's readiness in facing every problem in their life. Thus, graduates are better prepared to face the life of society, nation and state, face the challenges of life in the present and in the future. In accordance with Lickona's statement that explains that "*character education is effective if it helps learners to take advantage of all their intellectual and cultural resources, including their faith traditions, as they make moral decisions. This character education should be integrated in the academic curriculum and evaluation*" (Lickona, 1996).

### **Natural Science Learning**

Natural science is a collection of knowledge systematically arranged, and in its use is generally limited to natural phenomena. Sund & Trowbridge (1973: 2) explains "*science is both a body of knowledge and a process*". Furthermore, science is defined as having three important elements of attitude, process and product. In line with the definition of the science, James B. Conant cited by Amien (in Jatmiko, 2004) defines natural science as a set of concepts interrelated to the concept charts that have evolved as a result of experiments and observations, useful for experimentation and observation furthermore.

Referring to the definition of natural science above, the nature of natural science includes four elements, namely: (1) *products*: in the form of facts, principles, theories, and laws; (2) *process*: problem-solving procedure through scientific method; Scientific methods include observation, hypothesis formation, experimental design, experiment or investigation, hypothesis testing through experimentation; evaluation, measurement, and conclusion; (3) *application*: application of scientific method or work and concept of science in everyday life; (4) *attitudes*: curiosity about objects, natural phenomena, living things, and causal relationships that create new problems that can be solved through correct procedures; Science is open ended ([http://www.puskur.net/mdl/050\\_ModelIPA\\_Trpd.pdf](http://www.puskur.net/mdl/050_ModelIPA_Trpd.pdf)).

Koballa & Chiappetta (2010: 105) defines science as "*a way of thinking, a way of investigating, a body of knowledge, and its interaction with technology and society*". Thus it can be interpreted that in science there are dimensions of ways of thinking, how to investigate, building science, and its relation to technology and society. This became the basis of the importance of science learning which developed a scientific process for the formation of student mindset.

The science-learning process in schools emphasizes the provision of hands-on experience to develop competencies to explore and understand the natural world scientifically. This is because natural science is necessary in everyday life to meet human needs through the solving of identifiable problems. The application of natural science needs to be done wisely in order not to adversely affect the environment. At the elementary school level, science learning is expected to have an emphasis on STSE learning (Science, Technology, Society and Environment) directed at the learning experience to design and create a work through the application of the concept of science and the competence of scientific work wisely.

### **Model "TSTS" In Science Learning**

Thinking skills is a mental process that requires an individual to integrate knowledge, skills and attitude in an effort to understand the environment. One of the objectives of the national education system is to enhance the thinking skills of students. This objective can be achieved through a curriculum that emphasises thoughtful learning. Teaching and learning that emphasises thinking skills is a foundation

for thoughtful learning. Thoughtful learning is achieved if students are actively involved in the teaching and learning process. Activities should be organized to provide skills for conceptualization, problem solving and decision-making.

Thinking skills can be categorized into critical thinking skills and creative thinking skills. A person who thinks critically always evaluates an idea in a systematic manner before accepting it. A person who thinks creatively has a high level of imagination, is able to generate original and innovative ideas, and modify ideas and products.

Thinking strategies are higher order thinking processes that involve various steps. Each step involves various critical and creative thinking skills. The ability to formulate ideas is the ultimate aim of introducing thinking activities in the teaching and learning process. Examples of “TSTS” model implementation in science learning are presented in Figure 1.

Before the lesson is linked to the learning objectives, the teacher should examine all relationships of learning outcomes and propose learning activities that provide opportunities for thinking skills, thinking strategies for obtaining scientific attitudes and noble values, so as to enable students of character.

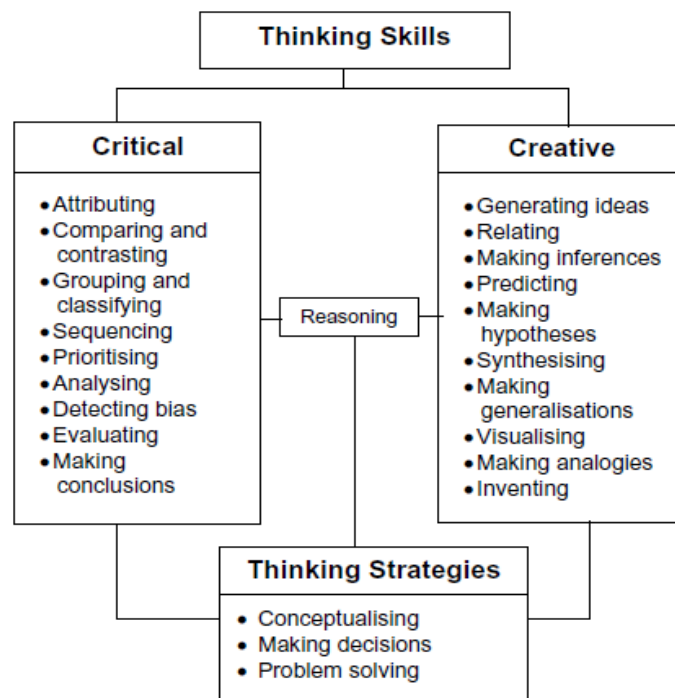


Figure 1. Model “TSTS” in science learning (Sumber: Ministry Of Education Malaysia 2002)

### STSE Approach

The Science Technology Society and Environment STSE approach integrates knowledge, skills, processes, and values to understand applications. Supported by the opinion of NC state University (2010: 1) states that STSE is “an interdisciplinary field of study that seeks to explore and understand the many ways that science and technology forms culture, values, and institutions”. This is reinforced by the opinion of Yeap Chin Heng et al. (2002: 13) which states that in the STSE approach “knowledge in science and technology is to be learned by the application of the principles of science and technology and their impact on society”.

STSE is one of the most important approach introduced to students and it can be implemented both in science learning activities and in everyday life, in accordance with current technological development demands. STSE Learning is divided into six domains of concepts, processes, applications, creativity, attitudes, and application relevance with real action. The link between the six domains according to Yager (1996) in Anna Poedjiadi (2009: 105).

The STSE approach facilitates student activities that develop knowledge of skills, processes, and values, provides application context, and illustrates principles. In the process there are activity discussions related to the application and strengthening knowledge, skills, processes and values.

The correlation between literacy of science, technology and character of students in STSE approach is so that learners have the ability to see things in an integrated manner by paying attention to the four STSE elements so as to gain a deeper understanding of the knowledge they have. As a consequence, it is hoped that the deeply understood knowledge will enable them to utilize the knowledge held in life. STSE is shown to build learners knowing the science, its development and how the development of science can affect the environment, technology, and society on a reciprocal basis.

The STSE learning approach applied in the classroom by a teacher will be able to change the thinking process of the students, because knowledge of science and technology is taught by application of the principles of science and technology impact on society and environment.

### Local wisdom

Local wisdom is understood as in accordance with the opinion of Suhartini (2009: 208) that is adapting to the environment, the society acquires and develops a wisdom that is in the form of knowledge or ideas, customs norms, cultural values, activities, and equipment as the result of abstraction to manage the environment. Often people's knowledge about the local environment is an accurate guide in developing life in their neighborhoods.

Ritohardoyo (2006: 51) explains that human behavior towards environment caused by human behavior is influenced by some basic factor, supporter, motivator and perception, and environmental factors both physical environment and social environment, as in Figure 2. Furthermore order of behavior can be described in a cycle diagram, a series of elements of interpersonal relationships, value systems, thought patterns, attitudes, behaviors and norms (Ronald, 1988 in Ritohardoyo, 2006: 52). Basically human as a member of society is very dependent on the land and residence. Here there is a difference between land and residence. Land is a natural environment whereas the dwelling is an artificial environment (built). The built environment is affected by the perpetrator cycle and vice versa (Figure 3).

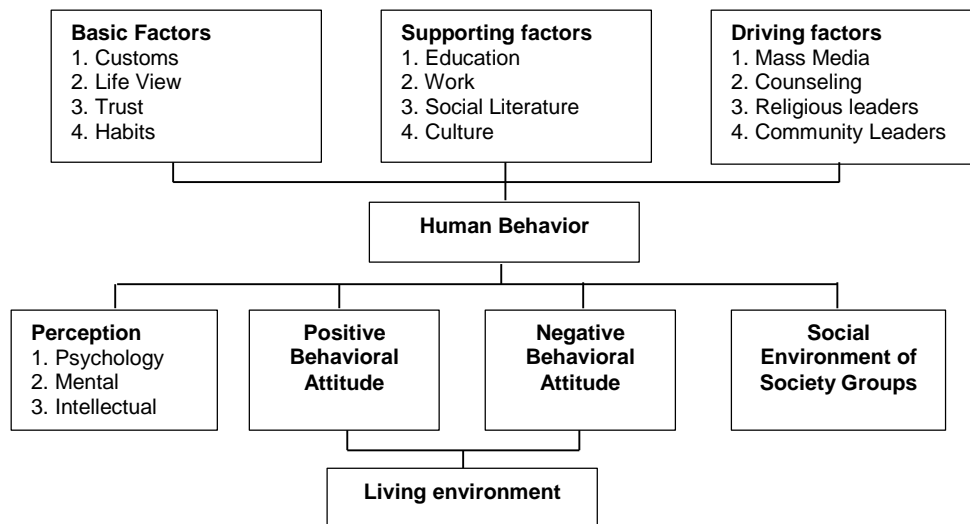


Figure 2. Relationship of Some Factors Influence on Human Behavior (Sumber: Green, 1980 dalam Ritohardoyo, 2006)

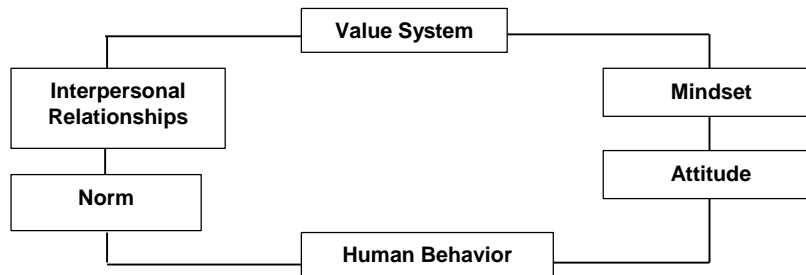


Figure 3. Recycling Scheme of Human Behavior (Sumber: Ronald dalam Ritohardoyo, 2006)

### Application of Standards In Science Learning

National Science Teacher Association (NSTA) (2003: 18) states that one of the standards of science is a science as inquiry. This standard states the importance of training students to investigate natural phenomena. Observation, asking questions, hypothesizing, designing experiments, measuring, collecting data, presenting data, and analyzing data are science learning activities through an inquiry process.

NSTA (2003: 4-30) mentions 10 standards for the preparation of science teachers, namely: (1) content standards; (2) nature of science standards; (3) inquiry standards; (4) issues standards; (5) standard of general teaching skills; (6) curriculum standards; (7) science and society standards; (8) assessment standards; (9) safety and welfare standards; and (10) professional growth standards.

Based on the analysis of Benchmarks For Science Literacy (AAAS American Association for the Advancement of Science, 1993: 59-93), the standard of scientific content includes: Physics setting; Earth; The process of forming the earth; Material structure; Energy transport; Motion; Nature of style; Biodiversity, heredity; cell; Interdependence; The flow of substances and energy; evolution; Human identity; Human growth; Basic functions; Physical health; and Mental health.

Description of the attachment of character aspects in the application of Scientific inquiry standards are capable of generating inquiry questions and problem solving, the content standards are able to achieve the competence of the content of the science either Biology, Physics, Chemistry, Environment, Earth, Astronomy; Standardized processes are able to train students to experience various learning processes (experiments, demonstrations, discussions, role playing, games, reference reviews) and assessment standards will evaluate students according to their learning experience (tests, performance, tasks, portfolios).

### CONCLUSION

1. Integrating characters in science learning, it is necessary to balance the four dimensions of science (ways of thinking, ways of investigating, knowledge, and science-technology-society).
2. Optimizing the ways of thinking and ways of investigating through the model "TSTS".
3. Local wisdom is optimized through STSE-based learning.
4. Global competition is anticipated by the application of international standards of science teaching.

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