

**THE REFORM OF LEARNING SCIENCE
THROUGH MULTIPLE INTELEAGENT PARADIGM TO AGAINST
CURRICULUM IMPLEMENTATION 2013 IN SD/MI
(Considered From The Dynamics Between Teacher And Student)**

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ABSTRACT

Science education quality improvement efforts in Indonesia is not enough by changed the curriculum. The curriculum change has to be followed paradigm shift in learning science, from teaching paradigm to the learning paradigm. The learning paradigm can be realized by either integrating the knowledge, senses, environment, curriculum, and the sense of mind (intelligence variety) owned by each student. Comprehensively it can maximize the diverse capabilities of multiple Intelligence owned science students in the learning process. By using the paradigm of learning -based multiple Intelligence and scientific approach to the curriculum in 2013, students are guided to reconstruct the knowledge that needs to be capable by observes the students' characteristics of various types of intelligences. Learning of science should be meaningful for them. It means the students, in learning science, should be able to see that science is important for them to face life in the future. The students need to be exposed to the problems which is realistic and contextual in purpose it can not be imagined by students and starting from what have been experienced and known by students. Therefore, in line with the pillars of the curriculum in 2013 that is productive, creative, innovative, and affective then the teacher must understand the characteristics of students' diverse capabilities so that science can be understood well by students not only as the level of knowledge.

Key words : *Reform, Learning science, Paradigm, Learning, Multiple Intelligence.*

A. Introduction

School is a learning place for students to prepare themselves to face the future. The future is full of challenges and different from their future which is learned in previously years in school. The rapid development of technology and science making a change the condition from year to year. About 10-15 years ago, globalization is still a discourse, but now has become a reality. The need for mastery of science increased. Relational understanding in learning science more important and meaningful than instrumental understanding.

Because of rapidly changing circumstances, the school should be able to adjust toward the change so that the graduates are not left behind and get into trouble later in creating jobs for

themselves and for others. As a consequence, curriculum in school have to adjust to the demands of the times, especially the advancement of science, technology and information. Then it is natural if the curriculum change regularly.

However, the curriculum changes are not enough. Change the curriculum does not change the way of thinking itself. Curriculum changes are not followed in practice by a change in the learning and assessment process which is used. Since from the beginning, the teaching paradigm is used in learning process¹. Teachers actively transferring knowledge to the students' mind and students passively receive it. Understanding which is achieved by the students is only instrumental understanding. Students complete a question of physics and chemistry merely using the formula without understanding why using these formulas or why students use certain strategies. Students use these formulas because it is what the teacher taught. Often students do not dare to use their own way, afraid of being incompatible with what is taught by the teacher. Students' way of thinking is simply an imitation of the teacher's way of thinking. Students are no longer as themselves, but they become a small robot in their way of thinking.

Similarly in the process of learning, the way how to collect student's learning result data do not change. The assessment which is used always a kind of objective tests with its variations. Even, learning process ultimately affected by the assessment which is used. Learning is for testing. The important thing is to pass the test and get a high score. Finally, schools are racing to pursue high score of the UN, so that all efforts of learning is directed to make students able to answer the questions of National Exam or questions for college entrance exam. Though National Exam is not a measure whether someone understands toward what they have been learned. Since there is no change in the leaning paradigm of science and its evaluation then the quality of the graduates of our schools become low. Passive learning habits from elementary through high school bring into college. Is it not strange, when students were asked about the concepts they have learned in school they did not want to answer (probably because they could not answer, possibly due to fear of being wrong or because they are not sure of the answer).

1. The need for a change paradigm in learning science universally

To face the challenges of the present time, curriculum which is going on needs to be changed. The purpose of learning is not just to know, but the student can apply and able to do what they known. If during the learning process is more geared to make students knowing something (facts, concepts, procedures) by transferring knowledge into the student's mind, then it is not enough anymore.

Science deals with the way how to find out about nature systematically, so that science is not only for mastery the knowledge collection in the form of facts, concepts, or principles, but also a process of discovery. Science education is expected to be a vehicle for students to learn about themselves and the environment, as well as prospects for further development in applying them in everyday life. The learning process emphasizes to provide direct experience to develop competence in order to explore and understand the nature scientifically. Science education is directed to do and inquiry so it can help learners to gain a deeper understanding of the nature around. Science is scientific knowledge, it is knowledge that has undergone the test of truth through the scientific method, with the characteristics: objective, methodical, systematic, universal, and tentative².

Basically science is watch over in terms of products, processes and the development of attitude.

1 Marpaung. 1998. Dan Mengajar ke Belajar Matematika. Makalah yang disajikan pada Seminar Rumpun MIPA, USD, Paingan, Yogyakarta. 10 Juni 1998

2 Depdiknas. 2007. Panduan pengembangan pembelajaran IPA terpadu SMP atau MTS. Jakarta. www. puskur. Net

These three dimensions are interrelated. This means that the learning process of science should contain the three dimensional science. Similarly, Carin and Sund defines science as a systematic knowledge and structured regularly, generally accepted (universal), and in the term of data set of observation and experimental result³. According to Collette and Chiappetta, essentially science composed of three dimensions, they are:

1. Science as a way of thinking such as human is enormous curiosity, imagination, and desire to understand phenomena, and then they possess attitudes, beliefs, and values that motivate them to answer questions and solve problems; (b) Science as a way of investigating such as human is desire to understand nature and to discover its laws must study objects and events with manner experimentation, observation, hypotheses, tested and validated; (c) Science as a body of knowledge from the scientific disciplines represents the creative products of human invention such as the facts, concepts, principles, laws, theories, and models specific for the content science⁴.

According to Carin and Sund, science has three essential elements. They are:

(a) *Processes or methods as ways of investigating problems, observing such as making hypotheses, designing experiments, evaluating data and measuring;* (b) *Products such as the facts, principles, laws, theories;* (c) *Human attitudes as beliefs, values, opinions*⁵.

Referring to the notion of science, then science is essentially composed of four dimensions:

1. Attitudes: curiosity toward the object, nature phenomenon, living creature, and causal relation which is rise new problem that can be solved through the proper procedures.
2. Process: The procedure of solving problems through scientific method; scientific method are arranging hypothesis, design of experiments or trials, evaluation, measurement, and drawing the conclusion.
3. Product: it contains facts, principle, theory, and law.
4. Application: the application of scientific method and concept of science in everyday life.

Students have to understand what they are learned and able to use that knowledge to solve problems, draw conclusions logically, well communicate, and able to see the connection between a concept with other concepts. That competence which is expected from the students who is studying science. Curriculum based on competency intended in order that students who learn science try to seek that competence. Despite, even it is a good intentions, if not accompanied by a willingness to change the way of thinking, then the purpose will not be achieved as we have experienced so far. There is needs a new reform in learning science, at least it includes three aspect:

1. The change of learning paradigm from teaching paradigm to learning paradigm.
2. The change of evaluation paradigm, from evaluation that relies on standardized test (objective test) as type of assessment to the evaluation which based on variety of assessment.
3. The change of paradigm which emphasizes ratio to the paradigm which is blend to the various type of intelligence that includes rational intelligence, emotional, and spiritual, or according to Gardner (in Bellanca, et.al.) are classified into:

1. Intelligence logical/mathematical

3 Sulistyorini. 2007. Pembelajaran IPA sekolah dasar. Semarang: Universitas Negeri Semarang.

4 Collette dan Chiappetta. 1994. Collette, A. T., & Chiappetta, E. L. (1994). Science instruction in the middle and secondary schools. New York: Macmillan Publishing Company.

5 Carin dan Sund. 1989. Teaching science through discovery. London: Merrill Publishing Company., A Bell., & Howell Information Company.

2. Intelligence verbal/linguistic
3. Intelligence musical/rhythmic
4. Intelligence motor/kinesthetic
5. Intelligence visual/spatial
6. Interpersonal intelligence
7. Intrapersonal intelligence
8. Naturalistic intelligence⁶.

For example, learning science in elementary school, it is developed the concept of SANI (polite, open and communicative) as a modification of RANI (friendly, open and communicative). Friendly is not equivalent with courtesy. Friendly has connotation on the way how to speak while courtesy has connotations in term deeds. People who act friendly is not consider to have courtesy, because a lot of people who speak smoothly, it sound polite but the actions are not same as what is said. In contrary, courtesy describe the actions of people who are generally friendly. If the child wants to be a well-mannered, they should be treated in a dignified manner not only required them in order to be well-mannered. In this case, adults who need to understand the characteristic of the children, it is not the children who should be demanded to behave and understand adults. In other words, an adult should be able to manage their emotions when they are dealing with a child, according to their judgment, that deviate from the general rule and adults can guide children to be open minded (think rationally) in communicative way so it can be accepted by child.

4. The problems that might appear on Teachers and Students

It is proper that in starting something new will show-up problems. The problem is whether we want to solve the problem. Willpower is not the same as desire. But the will can not arise due to several constraints such as:

1. Students which is only being passive toward the changes around them especially development of the science that is increase rapidly, it is caused during their learning of science education they only learn theory so that students are not able to respond the problems which is arise especially to look for solution of these problems.
2. Students are still dependent to the teacher, so they are not independent in constructing knowledge. Their knowledge only stock-still to the information which is provided by the teacher.
3. Teachers feel they have received additional burden without additional incentive. It can be understood because teachers have been long-serving in education without adequate remuneration.
4. The most difficult is to change habits, moreover if the habit is considered enough or good.
5. Reticence. There is desire to change but feel that have a trouble to do it and do not want to share to others, especially to the boss.
6. Stay still attitude until there is instruction. This thought pattern become a culture, so that people no longer creative. Moreover, if the desire to do a reform has no appreciated, it is inhibited with various reason and rules.
7. The lack commitment from the top to improve the quality of education and respect the teachers truly.
8. Unfamiliar synergy. Interaction, collaboration, and reflection are a way to overcome the problem.

⁶ Bellanca, et.al., 1997. Multiple Assesment for Multiple Intelegences. Arlington Heights: IRI Skylight.

5. Evaluation between teacher and student

Knowledge called science can not be transferred from someone who knows to people who are learning. In learning science, teachers should not move knowledge from their mind to students' mind through lectures (taught) but help students to construct knowledge in their mind. Teacher need to create condition that enable students to do construction process, for example: students' learning time is no longer controlled by the teacher but by the students themselves. The subject matter is no longer atomistic but holistic. Teachers help student in order that something potential become actual. Another way is through interaction and discussion with friends which is led by teacher. Someone interested in learning something if they could see something which is learned can be used to fulfill their needs, in other words useful to them. Therefore, learning science has to be meaningful, it means students see that science is important for their future because it can help them to solve problems they faced. In this way students begin learning from problem that are realistic, means it can be imagined by students, or it has connection with the real world. This kind of learning approach called as contextual or realistic approach. By this kind of learning opportunity for the students to gain relational understanding become larger. Paradigm as basis of learning is called *learning paradigm*.

This change is not easy to do, because it is difficult to change habits that have been carried out for years. Moreover, if what it has been doing become a belief. Although it is difficult, that change is needed in order that we can catch up with the other nation. The reform by change paradigm of learning science need to held now together with curriculum change that will come. Because, if not then the intention of the curriculum will not be achieved.

6. The science essence in teacher's and student's perspective

The essence of science needs a critical study. This will certainly bring a consequence to other people perspective in responding and comprehending the essence of science. The consequence of people perspective (teachers) to what is a science in a narrow scope will bring a color to a study applied when a teacher performs an activity with children in a science study. Actually a more completed understanding in describing science, doesn't certainly perceive a science as an imaginary knowledge bank. Before the curriculum based on competence is applied, teachers consider sciences only in mind and the characteristic of sciences theoretic so the students only imagine every knowledge about science in their mind without consistency or application after they study sciences. Finally teachers and students perceive cynically to sciences whereas the sciences is very important to the future of students. Therefore, it is necessary to start it by the teacher first to understand science definition in wider perspective. Several definition of science are in the following:

1. Science as a bank of knowledge
2. Science as an exploration process
3. Science as a bank of value
4. Science as a way to know the world
5. Science as a social institution
6. Science as a result of human construction
7. Science as a daily activity

The principle of lecturing process is lecturing, whereas lecturing is a change process of individual behavior that is relatively persistent as a result of experience. Therefore, study is an exertion of conducive environment in order to the study process can grow and develop. Because

the study characteristic is engineer, the process of preparation involves a purpose. In sociological perspective, study process is a process of student preparation in order to be able to have their life in a society. School is social system that is a miniature of wide society. Therefore, study process cannot be separated from a socialization process and what are studied in the school should be reflections of real condition around the students that can be exploited or implemented in a society⁷.

Study is an arranged combination involving human unres, material unres, facility unres, equipment unres, and procedure unres that are influencing each goal of study⁸. In a study, there are four steps: a) a preparation as a surface of interest, b) delivery in the first meeting with new knowledge and new skill, c) a training of new knowledge and skill integration, d) a result performance as an application of new knowledge and skill to a real condition. Science is a *body of knowledge* that has been examined, that can be expressed in the form of general principle⁹. David states that:

Science is something that is discovered, some experimenting about the world around us, experimenting about things that will help us, facts about nature, what a scientist works on, facts about the earth and atmosphere, friction and tests about nature, trying to solve problems, the world's history, nature of the world, discovering new things, about the facts of the world, making things easier around home, chemicals and research¹⁰.

It means science is a process of finding something by some experiments about world is round, natural fact, earth, and atmosphere, trying to resolve natural problem, finding something new about world fact, making something easier for environment and research.

Science is defined as a knowledge that is gotten through data collection by using an experiment, observation, and conclusion to produce an explanation about a believable indication. There are three skills in sciences that are: a) a skill to know what is observed, b) a skill to predict what doesn't happen yet, and a skill to examine the follow-up of experiment result, c) scientific development. An activity of science study includes a skill development in giving a question, finding an answer, understanding an answer, completing an answer about "what", "why", and "how" about natural tendency or natural characteristic through systematic ways that will be applied in environment and technology. Those activities are known as scientific activity based on scientific method¹¹.

In studying science, students are directed to prove their prediction result by using theory through experiment by using scientific method. Science education in schools are expected to be able to be a tool for students to study themselves and their environment around, and also a prospect of following development in applying them in daily life, based on scientific method. Science study focused on direct experience to develop competences in order for the students to be able to understand environment around through the process of "looking for knowledge" and "acting". This will help students to get a deeper understanding. Therefore, science study in schools should:

- a. give experiences to students in order to be competent to do measuring many physical scales.
- b. encourage students about the importance of empirical observation in examining a scientific statement (hypothesis). This hypothesis is from an observation toward daily occurrences needing scientific improvement.

7 Depdiknas. 2003. Standar penilaian buku pelajaran sains. Jakarta.

8 Oemar. 1995. Kurikulum dan pembelajaran. Jakarta: Bumi Aksara.

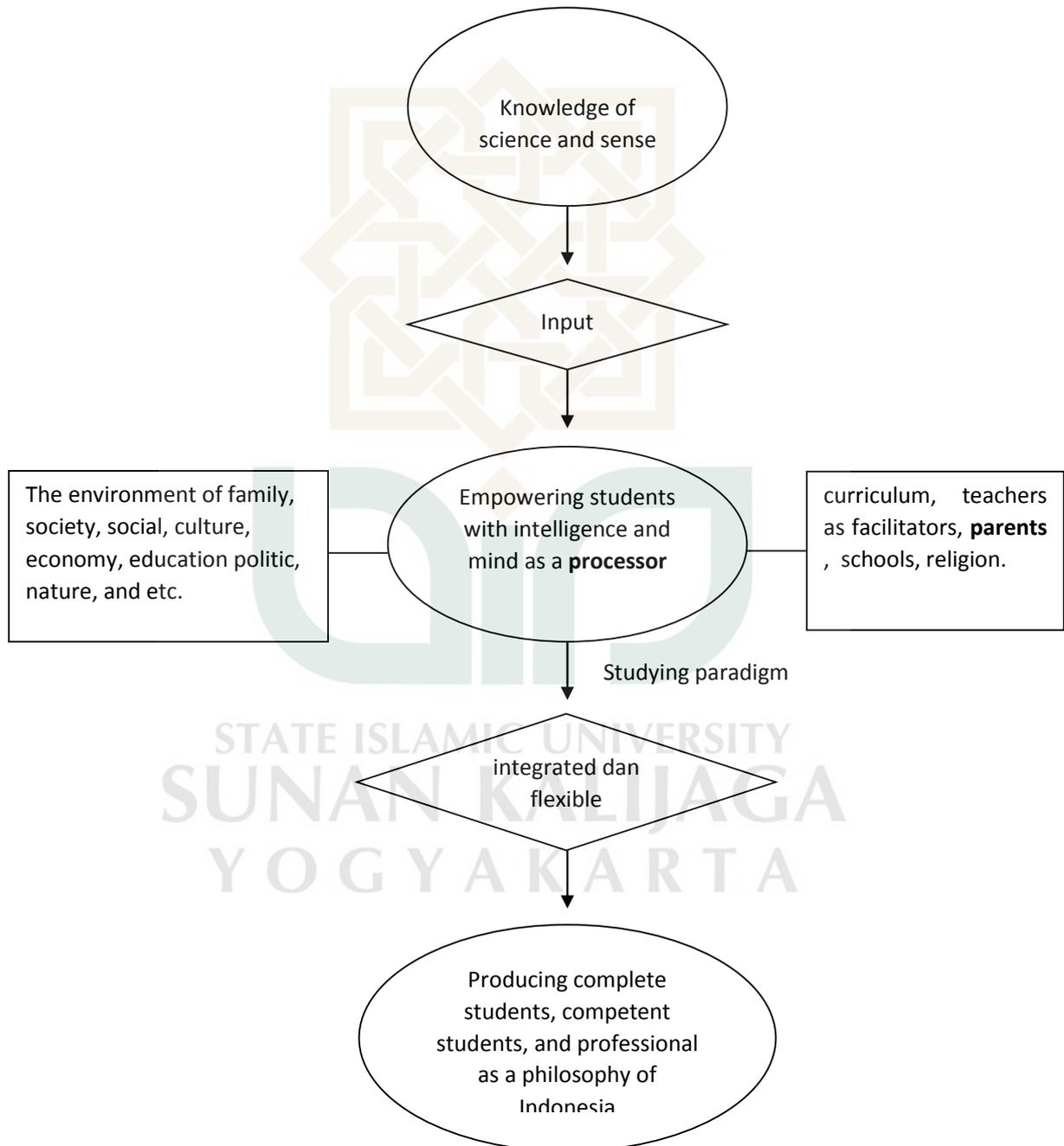
9 Meier. 2002. Panduan kreatif dan efektif merancang program pendidikan dan pelatihan. (Terjemahan Rahmani Astuti). New York: McGraw-Hill. (Buku asli diterbitkan tahun 2000).

10 David. 1974. Teaching science in elementary and middle schools. America: McKay Company, Inc.

11 Depdiknas. 2007. Panduan pengembangan pembelajaran IPA terpadu SMP atau MTS. Jakarta. www. puskur. Net

- c. train to think quantitatively that supports mathematic studying process, that is as an application of mathematics to real problems relating to natural phenomena.
- d. introduce technology world through creative activity in an activity of arranging and producing simple tools or an explanation about many tendencies and the potency of science in answering many problems.

8. The solution of science education reformation toward students and teachers



Scheme 1. Positions of students and teachers in a school

Actually a reformation of education begins from out intention and goal to complete an education cohesively. Many factors extremely influencing education developments now when the

case becomes a focus in the development of education. Actually students have a potential coming from themselves or from environment around. Actually, all extremely influence student empowering. By the change of curriculum, education in schools doesn't precisely create a good education system but confusion does. If the change of curriculum is followed by professionalism and competency had, teachers are not doubted.

teacher management → The quality of teachers increase → the quality of teacher works increase → the quality of students increase

a way to think relevantly with a purpose to education importance without private or institutional unsuccesses in order to those students become the main focus needing to be noticed. Empowering students to study from their experience "study how to study" to problems occurred with the result that the way of intelligent and mind can function as usual. In empowering a teacher position is only as a facilitator in study process in schools, so demanding students to construct their knowledge to be more impressive but still follow the procedures of science study delivered by teachers. Science study is an active process and extremely influenced by what will be studied by students. From this perspective the result of lecturing doesn't depend on what teachers explain, but is influenced by interaction result among some information gotten by them from the previous environment around the students with the response of students to information given by teachers. Science is received by students through the five senses that then is interpreted in mind and intelligence of students, teachers as facilitators by harmonizing aspects around like society, parents, social culture, religion and other environment to be a complete union without discriminating one of those aspects because their involvement extremely determines the success of student study and teacher's role completely. Ignoring one of those aspects will make a continual fault, in other words meeting point of attainment will not be realized. Because in participation to create students that completely competent, professional, like our country philosophy and also teachers that are really competent and professional in their field it is necessary to notice a reality show and teaching paradigm becomes studying paradigm that the characteristic is integrated (unite) and flexible (graciousness).

9. Closing

Fixing the quality of science education in Indonesia not only needs curriculum changes but also more. The changes of curriculum have to be followed by the change of paradigm in science study, that is the paradigm of teaching to the paradigm of studying. By using the paradigm of studying, students are guided to reconstruct knowledge needing to be mastered. The science education have to be meaningful for them. It means that students in science study have to be able to the importance of science for them to face their future. Therefore, students need to be faced to real and contextual problems or in other words, the problem can be imagined by students and begun from what they have and know.

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