

# Systemic Thinking Professional Teachers Learning Development

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## Abstract

This research is aimed to develop the way of thinking system among Junior High School Students in Sidrap and Sinjai regencies, South Sulawesi province, Indonesia. The ability of the thinking system is mainly important for students in Indonesia since it may create skills to anticipate the global change. This research applied a qualitative description approach with literature study method, interviews and observations held in 5 schools. The result of this research shows that thinking system hasn't yet been done properly because there are some obstacles such as incomplete curriculum and non-professional teachers. Based on the findings, schools need to have complete and proper curriculums, including improvement of the competence of professional teachers through training and education.

**Keywords:** *systemic thinking, professional teachers, learning development*

## Introduction

In a research made by The Waters Foundation, it is found that thinking in a school system project should be focused on and should support teachers' abilities in creating a learning atmosphere intended by the students. Therefore, the mission to reach is to improve teachers' capability in conducting learning activities which are more advantageous for students through an effective application of the systemic thinking system, habits, and media in the classroom instructions and school improvement. It is a fact that the usefulness of students to school is to study and develop their systemic thinking capacity. Schools in the United States of America and in almost all over the world are at present applying this thinking system to improve the qualities of their instructions and schools.

The advantage of a systemic thinking is not only to attain the achievement as stated in the learning standard but is also to create a systemic thinking at schools called "Citizen System" which is changing that makes the citizens should also change in line with the global demand. If the objective of an educational institution is to develop the students' skills and intellectual competences, it is necessary for the students to be able to manage any complexity of the problems in the future. Therefore, the educational institution is required to develop students who think and behave like the citizen system. The citizen system sees itself as the global community member, understands the complexity of this worldly system, and possesses ability to encounter any problems with adequate information capacity to make positive differences.

Many experts think that any tension to attain an academic standard, especially anything dealing with the curriculum is far from the vision of developing a citizen system. The statistic measure of a student's achievement at present is viewed as the most successful step. A school systemic thinking shows that both standard-based and systemic thinking education approaches may live together and complete one another. For most educators, the short-term objective includes the mastery of the class-level skills in the standard-based curriculum. this objective may be attained through and may change into a long-term "community system" development via systemic thinking in the learning environment. In this case, students will love the environment during their field practices relevant with the problem solving, interdisciplinary connection, and in-depth analysis of opportunities and dialogic thoughts.

A thinking-learning environment system is expected to motivate lazy students and attract their interest. Teachers reported that the characteristics of the thought-system visual aids enable students to organize and express their thought. The aids help motivate the students with the tendency of showing low performance and those with some reluctance and shame to be involved in learning activities. Teachers know that students with a great competence in making socializations with their fellow students will be able to make their systemic thinking realm be easily connected, gain a greater point of view, and possess a full spirit to share new insights. Peter Senger citing a book in Dutch with the title of *Naturrelijk Leren: Systeem denken die en lerende sekoleh* written by Janjuten states that students should be taught to interpret their realities. They will do the interpretations continuously. But their ability in enlarging their interpretation of their realities and in making their instinct lead to a more complex subject should be developed from time to time.

It is important to prioritize the effort to promote teachers' efforts to develop and apply their systemic thinking ability system in their teaching and learning activities. The future of students is dependent upon the effort made today. Students should possess skills and knowledge needed to manage and solve complex problems. In this 21 century, it is important that the users of schools and classrooms try to develop and maintain any learning activities dealing with the citizen system. Moreover, they should also prepare future powerful citizens. Teachers are not allowed to look down their students' ability in thinking systematically and to revise learning practice into a better one.

From the descriptions above it is known that it is important to develop systemic thinking among the Junior High School students in Sidrap and Sinjai regencies since in fact they lack systemic thinking ability.

## Method

It was a case study employing a descriptive qualitative approach with the method of literature where the data were collected using interviews and observations techniques in 5 Junior High Schools in Sidrap and Sinjai regencies, South Sulawesi province, Indonesia.

## Results and Discussion

### One's Thinking Habits

A teacher always tries to develop his/her systemic thinking in the classroom by reinforcing a number of thinking habits that include systematic thinking principles. These habits attracts some experts in the systemic thinking including Peter Senger. He said (1990) that Man may improve their organizational capabilities through a learning processes; ... *...where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together.* Peter Senger offers five advices as a component of technology to attain a learner's organization objective: thinking system, personal mastery, mental models, shared vision and learning team. With the same spirit, knowledge a company creates has a certain characteristic namely the discovery of a new knowledge is not a special activity, but as part of a way of life and each Man is a knowledge worker.

A teacher finds that there is a close relationship between systemic thinking habit and learning objectives stated in the curriculum. Such a systemic thinking habit is a systemic thinking capabilities including:

- Describing how a mental model influences the present and future realities.
- Observing how elements in the system changes over time, where a pattern produces a trend.
- Perspective changes to improve understanding
- Identifying a complex circular nature of cause and result relation
- Considering short- and long-term consequences of an act
- Finding any unexpected consequences
- Recognizing impacts of time delay when you are exploring cause and effect relationship
- Trying to understand a grand picture
- Realizing that a systemic structure results in its own behaviors
- Checking results and changes of an act if a consecutive approach is adopted
- Doing test surface and assumption
- Using some understanding of a systemic structure to identify any possibilities of making use of an action
- Considering a problem fully and refusing any force to come to a quick conclusion.

### Establishing Systemic Thinking Abilities among Students in America

In the last thirteen years, the Waters Foundation has been holding trainings on a thinking system of what is the best way to build the maturity capabilities in university students' systemic thinking. This concept is borrowed from a learning theory giving an emphasis on learning styles, learning experiences, and multiple intelligence. The most effective training of

systemic thinking is dependent upon the visual, linguistic, and kinesthetic modalities. The visual characteristics of the thinking tool system may be represented by for examples, graphics of overtime behavior, causal loop diagram, an iceberg model of the thinking system, inferential ladders, reserve flow mapping, and parallel connection circle based on learning practice research. *Ludwig Von Bertalanffy (1985), The History and Status of General Systems Theory* mental sensations, freely competing individuals, or whatever else may be the case in the expectation that by putting them together again, conceptually or experimentally, the whole or system cell, mind, society would result and would be intelligible. We have learned, however, that for an understanding not only the elements but their interrelations as well are required-say, the interplay of enzymes in a cell, the interactions of many conscious and unconscious processes in the personality, the structure and dynamics of social systems, and so forth. Such problems appear even in physics. The advantage of using non linguistic representation is that it may promote students' learning. The more the two linguistic and nonlinguistic representation systems are made use of, the more one will be able to think and remember knowledge. Ability to express complex thoughts, insights, and new ideas orally and in written form is an integral part of learning the systemic thinking namely speaking and listening skills including dialogues, discussions, examinations and advocacies. A general vocabulary helps facilitate a dialogue on a relevant problem-based complex system and scenario. According to Hebert A. Simon (1976), decisions in an organization will be based on premises including both empirical and normative elements. These two different kinds of premises are called factual and value premises. Factual premises are made from knowledge and information about the organization and its environment. Value premises comprises goals and moral and law-given constraints. In a dialogue, then, each participant does not try to make general ideas or an information item that yang been introduced to him. Whereas, it can be stated that two persons may make something the same namely creating something new together. A linguistic strategy may be employed to train systemic thinking habits since it may help crease new insights and result in new understanding of complex problems. A study written in the *Fundamental of Experiential Training and Development* showed that people remember 20% of what they hear, 50% of what they see, ad 80% of what they do. The Experiential Learning Theory defines learning as a process where knowledge is created through transformation of experiences. Knowledge is resulted from a combination of capturing and changing experiences. A good experiential learning is obtained through the development of abstract concepts for instances games, physical challenges, role playing, simulation or modeling computer. Activities of learning the systemic thinking should be specially designed for students in terms of their concrete or abstract conceptual development, and their effective capacity. Some of us see new information by understanding real concepts, feeling the world qualities, depending on our senses and immersing ourselves in concrete realities. We tend to feel, understand or obtain information through symbolic or abstract representations to think, analyze, and make systemic planning instead of using sensation as a guide. Three modalities namely visual modality as a tool for speaking and listening, linguistic modality for communication approach and kinesthetic modality for learning activities. All maximize abilities in building systemic thinking capacity for students in all ages.

Development of the curriculum in Junior High School runs well but some improvement of curriculum quality at the school level has not worked well as expected by the policy makers. Syllabuses used in various schools in Indonesia are emphasized on developing of what students learn instead of how students use their thoughts in order to make the students

master the content of their thoughts using various information in the form of learning materials. Ideally, a curriculum should pay attention to the balance between the two main aspects as presented in the Picture below.



Picture 1. Improving Critical Thinking Skills Improving Information Mastery (Learning Materials)

The existing curriculum is more focused on the development of all coverage of contents than on the students' way of thinking. Teachers are given competences to develop their thinking skills and contents with science, but it cannot keep up with the advancement reflected in the curriculum adopted by developed countries. One of the causes of failures the schools experience in accompanying students to improve their own capacities in their learning power are that the teachers are less trained to improve their competences in critical thinking skills where this causes the development of critical thinking capabilities among students to be limited. According to Philip H. Combs (1970) that *the social bias of educational systems which are seemingly democratic has been repeatedly shown in studies made of socio- economic origins of European student who have managed to get through secondary school and into the university*. While according to Thomas L Friedeman (2008) that at other times, Friedman is refreshingly realistic. 'Rapid economic growth and population expansion,' he writes, 'are driving the destruction of forests and other ecosystems at unprecedented rate. The destruction of these forests and biodiversity-rich environments, in turn, contributes to climate change by releasing more carbon in the atmosphere.' Here Friedman recognizes the interconnections that underlie the environmental crisis and which necessitate a shift in our whole way of doing things. He is robust in recognizing that any effective response to climate change must include hi-tech solutions such as nuclear power, although his proposal for an 'Energy Internet' ('one big seamless platform for using, storing, generating and even buying and selling clean electrons') sounds impractical. A large-scale fusion of information technology and energy technology could have many benefits, but in a world of states competing for energy resources, and using these resources as geopolitical levers, there is no prospect of such a scheme operating at the global level. Even so, Friedman's focus on technical fixes for environmental problems is closer to reality than mainstream green thinking, which clings to a utopian faith in political transformation

The impact of this weakness is that schools is threatened to help students become commanders that may force them to learn by themselves or learning how to learn. Students are difficult to be autonomous in managing ideas in their thoughts, and they are limited in sing their thoughts to connect ideas in a disciplinary fashion. Therefore, many teachers expresses complaints that they had a real difficulty in establishing 5 learning pillars: critical,

creative, and innovative thinking supported by the pillar of social intelligence development in collaboration and competition.

The curriculum the schools are developing at present, either the syllabuses or the Learning Plan, has been yet focused on developing competence achievement indicators, where thinking skills and thinking contents are simultaneously integrated. This is also the case in the application of the curriculum in the classroom that has still been focused on the learning materials instead of thinking capabilities. This may be seen from the indicators of the learning result evaluation which are more dominated by exercises and working on problems.

## **Building Systemic Thinking Ability among Students in Sidrap and Sinjai Regencies, South Sulawesi Province**

Education plays an important role for a nation, as a result it should be continuously developed in line with the development of the era. Through education, a nation may improve its education quality. The goal of our national education is to enhance human resources possessing values of being faithful and pious to one and only one God, possessing a moral and noble character; being discipline, responsible, autonomous and intelligent. Due to the importance of the roles of education, the government always tries to improve the quality of education as optimally as possible. The efforts the government has been doing are among others the improvement and development of the curriculum, improvement of teachers' quality in the form of upgrading, seminars, and improvement of facilities and infrastructure intended to improve the students' achievement. Teaching is not only to convey teaching materials but also to train students to think, to use their cognitive structure in a full and well-directed manner. Teaching materials are used as the medium instead of the goal in training students' thinking ability. Teaching by merely conveying information will make students lose their motivation and concentration. Teaching is to ask students to think, so that they will be able to become students who are intelligent and able to solve any problem they encounter.

Thinking is to relate facts and information to make decisions of behaving. The thinking process starts from the fact which is then sensed and processed in the brain by relating it to the existing information. The result of such a thinking process will result in any thought that may be used as creative problem solving.

Mental activities in the feelings and understanding depend on the external stimulation in a process called sensation and attention. A high mental process called thinking happens in the brain. Recalling invites previous experiences into the mind and starts forming an association chain. This association chain does not refer to what we concretely see but to mental imaginations. Focused thought or problem solving thoughts are considered as a type of the highest thought. Thought will be focused if we plan what action to do. Problem solving will occur when one find that one feels real disturbances either physically or mentally. The highest form of thought deals with the meaning and concept of something, so that it is more abstract than real in nature.

In an educational institution in which a student has developed a systemic thinking system may be seen from something inherent in certain physical movements caught by senses. A student who sees something will consider the thing under the framework of certain theories, concepts or laws. Problem solving is always developing by imagining new relations among

abstractions. A new relation is determined based on an understanding or definition. The teaching-learning process may succeed well if there is a reciprocal interaction between teacher and students, and students and students in learning activities held by students either in group or individually. Through any learning involving the students' activities, students may improve their understanding and mastery of learning materials. A success of a learning process is greatly influenced by the accuracy in choosing a learning strategy employed. Learning strategy is a leaning activities a teacher and students should do in order to make the learning goal may be attained effectively and efficiently. In a learning strategy, a set of learning materials and procedures used together to result in some learning achievements among students is determined. Therefore, the teacher should choose a proper learning strategy to attain such a goal. What should be attained in learning will determine how to reach the attainment. The application of a teaching-learning process in the classroom is directed to improve students' ability to think critically. Learning process in the classroom is directed to improve students' ability in memorizing information, whereas systemic thinking skill is one of the basic of intellectual capitals which are very important for anyone and are a fundamental part of human maturity. As a result, developing critical thinking skills is greatly necessary for students in each level of education. The main cause why critical thinking ability has not develop yet is that the curriculum in general is designed in such a way that teachers do not have a special focus due to the target of a broad materials to reach.

Learning activities in Junior High Schools in Sidrap and Sinjai regencies, South Sulawesi province tended to be conducted using lecturing methods so that the students could not understand the concepts of learning materials well. Most teachers were still reluctant to teach a direct learning model, and paid less attention to their students' activities in their teaching-learning process. The teachers did not apply varied learning methods or models so that their learning motivation and activities were difficult to be flourished using systematic thinking manner. Moreover, the teachers did not much make use of learning materials to direct their students. Another problem is the low critical thinking ability among he students considered from the quality of the students' questions and answers during the teaching-learning process. The students showed less ability in using their reasoning when they responded to any information they got. Moreover, the average grades of their daily test during the last two years were under the levels of the Minimum Mastery Criteria (KKM) where the average grades of the students each year were low.

On the basis of the preliminary studies conducted by the researchers in Junior High Schools in Sidrap and Sinjai regencies, it was known that students' motivation especially in studying science was very low due to their low curiosity about learning materials. This is shown by the fact that there were some students who asked questions during the teaching-learning process. Students could not accept any different opinions well and showed less cooperation among classmates. From the preliminary studies, it can be stated that the development of the systemic thinking was done well due to some hindrances such as the curriculum that did not much support the program, and the teachers who are not ready or who were not professional. Therefore, the schools in the research site especially needed a curriculum which is appropriate with the condition and teachers who are skilful in developing systemic thinking through various trainings.

From the findings of this present research, it is found that growing students' scientific attitudes will be useful, although time for the learning process is little, if students as the learning subject are given opportunities to be active in the teaching-learning process.

Teachers are required to be able to choose proper learning method to improve their students' mastery of concepts in their subjects and to understand the situation they face at schools. Moreover, teachers not only teach but also make their students understand what they study. Teachers said that since the facilities and learning aids in their schools were limited, efforts to improve the students' understanding of the lesson completely and systemic thinking were still merely focused on the teachers themselves. Therefore, learning strategies in the classrooms should be modified to make the students to have better motivation to understand and master their learning materials. The teachers' roles and tasks are to give information and also to encourage their students to learn actively in order to be able to solve any problems during the learning process.

On the basis of the students' learning problems, achievement and participation, a proper teaching strategy and model is needed to improve their critical thinking ability and this at last may influence their learning achievement. According to Sanjaya, an inquiry learning model is a series of learning activities giving an emphasis on analytical and critical thinking process to look for and find a solution to problems posed. This thinking process occurs during question and answer activities between a teacher and his/her students. The essence of this inquiry learning is to give students some learning activities to solve problems they encounter in their real life. In this inquiry learning, teachers should plan a situation in such a way that students work like inquirers using procedures in identifying problems.

## Conclusion

Junior High Schools in Sidrap and Sinjai regencies are applying and integrating systemic thinking into instructions in their efforts to improve their condition. This 21 century demands that anyone to develop skills and knowledge needed to manage any complex problems either at present or in the future. So, an educational institution should try to develop students thinking and acting as Citizen System. In this Citizen System, we see ourselves itself as members of the global community. We understand complexity of the worldly system at present and posses abilities in facing any problems using our knowledge and skills.

The objective of the best standard- and the citizen system- based curriculums may be reached through systemic thinking learning in the classroom environment. In this environment, students do relevant field practices in doing any problem solving, making interdisciplinary connection, and gaining opportunities to analyze, and doing dialogic thinking. It is also important that at schools and in the classrooms, the 21 century learning activities with its Citizen System should be developed and maintained to prepare the next generation to compete and understand problems in the future.

Educators should not look down the students' systemic thinking abilities and should reexamine learning practices in terms of the goal and part of education. Teachers should not give tasks to the students beyond their ability, and they should plan tasks done at schools and also at home. Therefore, their students do not lose their opportunities to play and interact with their fellow students at schools and they do not have any difficulty in developing their way of thinking since their attention is not merely focused on completing tasks given by their teachers.

The tasks given to the students should be adjusted in such a way that teachers may examine the tasks and may lead their students' ways of thinking and give comments on their



tasks the students do. Up to now, some think that ten-year students may think and use tools dealing with systemic thinking. They are able to solve complex problems, develop great ideas on interesting topics and produce insights that the activities in the classroom may be related to relevant problems in real life. They may manipulate and apply thinking tools with surprising skills and insights. Teachers are viewed as facilitators in the classrooms, and this happens when students are not give excessive burdens or tasks, when the curriculum is in line with the school condition and when the teachers are very skillful and professional.

From the descriptions above, it is known that systemic thinking and curriculum development that have been processed at schools in Sidrap and Sinjai regencies, South Sulawesi, have not been focused on the development of critical thinking skills integrated with information development as the contents of the students' thinking ability that may result in high-quality and more innovative learning products. In other words, from the research result, it can be stated that the systemic thinking and curriculum development in the two regencies should still be encouraged.

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