Upgrading Statistical Reasoning Ability Junior High School Students Through Contextual Teaching And Learning

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ABSTRACT. This article presents a Contextual Teaching and Learning what it is and what are its characteristics? What is the statistical reasoning ability? Why Contextual Teaching and Learning can develop Traffic reasoning statistically junior secondary students? The ability to reason statistically very important owned by high school students first, because the ability reasoning statistical These students may have competence in terms of : 1) understand the information statistical express or implied on any problems encountered. 2) A good understanding of how to choose, present, reduce, and present data that will be used to address existing problems. 3) understanding and reasoning that both the statistical process as a whole including any calculations involved in the process. 4) understanding to solve the problem of statistically based on existing data, and interpret it in decision-making that can be applied generally. Therefore, to develop the statistical reasoning skills should consider learning approach used for junior secondary students. A model learning approach that is appropriate for school students first one of which is a contextual learning approach(Contextual*Teaching and Learning).* This contextual learning approach taking problems in daily life or simulated problems with dialogue, discussion, question and answer, and representation, Contextual teaching activities developed are: a) problem-based learning, b) learning with multi-context, c) self-learning, d) authentic assessment and e) community learning.

Keywords: *Reasoning Ability statistical, Approach Contextual Teaching and Learning.*

1. Introduction

The ability of reasoning statistically is the ability to understand the information contained in daily life based on the data statistic, the ability to answer a question problems with either based on existing data in a different way and get results that are not much different, statistical reasoning ability of data also means the ability to understand well how data selecting, presenting, reduce, and present the data to be used for the existing problems. This capability is particularly important to be developed at the middle school students. Since the development of cognitive (thinking) in children while in junior high school (SMP), put forward the views of Piaget, Vygotsky, and psychologists processing information (information-processing theory) states that the cognitive aspects include intellectual functions such as comprehension, knowledge, and skills think. For junior high school students, the development of major cognitive experienced is the formal operational, capable of abstract thinking by using certain symbols or operating rules of formal logic which is no longer bound by the objects that are concrete, such as increased analytical skills, ability to develop a possibilities based on two or more possibilities, ability to generalize and inferences of different categories of objects vary. To develop students' ability to statistically very important to consider the learning approach. One of them with contextual learning approach.

What is contextual learning and what are its characteristics? What is the statistical reasoning skills? Why contextual learning can develop statistical reasoning Traffic, junior secondary students ?. Posts in this article will attempt to explain and answer the questions that are posed.

2.   What is Contextual Teaching and Learning?

Contextual learning has grown in developed countries with different names. In the Netherlands developed the name *Realistic Mathematics Education (RME)* which explains that mathematics learning should be linked with the real life of students. In the United States growing by the name of *Contextual Teaching and Learning (CTL)* which essentially helps teachers to link the subject matter with real life and motivate students to relate the knowledge, they have acquired with their lives. Meanwhile in Michigan also developed *the Connected Mathematics Project (CMP)* which aims at integrating the mathematical idea into a real-life context in the hope that students can understand what he learned well and easily.

The definition of learning written by [1] formulating knowledge CTL as follows:

"The *CTL is an educational process that aims to helps students see meaning in the academic material they are studying by connecting academic subjects with the context of Reviews their daily lives, that is, in the context of open social, and cultural circumstances. To achieve this aim, the system encompasses the following eight components: making meaningful connections, doing significant work, self-regulated learning, collaborating, critical and creative thinking, nurturing the individual, reaching high standards, using authentic assessment ".*

The quote above implies that the CTL system is an educational process that aims to help students see meaning in lesson material they are learning by plugging in everyday contexts, namely the environmental context of personal, social and cultural. To achieve these objectives, the CTL system will guide students through eight main principles CTL namely: conduct a meaningful relationship, doing meaningful work, set way to learn themselves, cooperate, think critically and creatively, nurturing/caring for students' personal, achieve high standards and using assessment authentic.

While *The Washington State Consortium for Contextual teaching and Learning*   [2] formulated the definition of CTL as follows:

 "*Contextual teaching is teaching that enables students to reinforce, expand, and apply for Reviews their academic knowledge and skills in school and in a variety of out-of-school settings in order to solve simulated or real-world problems. Contextual learning Occurs when students apply and experience what is being taught referencing associated real problem with Reviews their roles and responsibilities as family numbers, citizens, students, and workers. Contextual teaching and learning emphasizes higher-level thinking knowledge transfer across academic disciplines, and collecting, analyzing and synthesizing information and of data from multiple sources and viewpoints.*

"Free translation, contextual teaching is teaching that allows students strengthen, expand, and apply knowledge and academic skills in various fields both at school and outside the school to solve the whole problem that exists in the real world. Contextual learning occurs when students apply and undergo what is taught with reference to the real problems associated with their roles and responsibilities as family members, community members, students, and as workers. Contextual teaching and learning emphasize higher level thinking, knowledge transfer through disciplines, and collecting, analyzing and syntesys information and data from various sources and viewpoints.

Thus, a concise statement about the notion of contextual learning of the author, contextual learning(*ContextualTeaching and Learning*) is the concept of learning that brings the real world into the classroom and encourage students to make connections between knowledge possessed by its application in everyday life, students gain knowledge and skills from the context, and of the process of constructing its own as a basis for solving the problems in her life as a member of society.

From the above, it can be concluded that the concept of contextual learning is learning that help teachers link between what is taught to the real situation of students. Besides contextual help

students find meaning in their lessons by connecting the material in the context of daily life. They make the important relationships that generate meaning by implementing self-regulated learning, working, creative and critical thinking, respect for others, reaching high standards, and participated in the duties of authentic assessment.

Characteristics of Learning Math Contextual

Learning mathematics contextually has several distinctive features as follows [3]:

a)   the filing of contextual problems to be solved or resolved by the students at the beginning of the learning process.

b)   the development means a tool or a mathematical model (for example pictures, graphs, charts, models specific objects) to obtain an informal answer from the problem. Answer informal student termed informal mathematics. How tools or models that serve as a bridge between the real world and the world to realize the abstract mathematical processes horizontal. The process of mathematical horizontal is the process of obtaining a mathematical informally by students.

c)   There was an interaction between teachers and students or between students and students or between students-specialists in an atmosphere democratic with regard to the settlement.

d)   There is a balance between the process of mathematical horizontal or obtaining mathematics informally by students and the mathematics vertical or formal mathematical discussion process (symbolically and abstracts) are led by a teacher or other person (can be one of the students) are seen as an expert. This means there are ample opportunities for students to discover, investigate or solve the issue of in order to find answers to the problems before it reached the stage of discussion of formal mathematics.

e)   There are ample opportunities for students to reflect, clicking interpretation and internalize things have be learned produced by students during the learning process.

Having regard to the above characteristics the authors conclude that learning is a contextual emphasis on the context of early learning, instead of the introduction of the concept in the abstract. In mathematics contextual process of developing concepts and mathematical ideas originated from the real world. The real world does not just mean physically concrete or tangible but also includes things that can be imagined by the mind of the student because according to his experience. This means that the problems that used in the early mathematics learning contextual may be problems actual for students.

3.   What Is Capabilities Reasoning Statistical?

Reasoning Statistical

Reasoning is a thought process that departed from the observation of the five senses (empirical observation) that produces a number of concepts and understanding , So the process of reasoning is based on similar observations will also be formed similar propositions, number of propositions that are known or assumed to be true, people infer a new proposition that was previously unknown. The premise is the proposition that formed the basis of inference, while in reasoning, the relationship between the premise and the conclusion is called consequences.

Reasoning statistically defined as the way people reason with statistical ideas and understand statistical information, [4]. While the statistical reasoning as a way to work with content statistics (remember, recognize and distinguish between the statistical concepts) and skills using statistical concepts in the stages of solving a particular issue. Statistical reasoning as a process using statistical content through three phases including 1) Understanding is to see the problem as one in the same class; 2) planning and execution, ie to apply appropriate methods for problem-solving; 3) Evaluation and interpretation of interpreting the result of problems related to the original (native), Chervany, Benson, and Iyer [5]. [6] states that statistical reasoning involves the interpretation of a decision based on a set of data, data representation, or summary statistics. Based on some of the definitions above it can be stated that the reasoning statistically a way or method to submit arguments and conclusion

logically by using ideas of statistics derived from statistical information.

Some of the research results which seeks to develop reasoning statistical in students, including [7] develop students' reasoning about the data and the statistical distribution of statistical data by using a statistical design specially for workshop. As a result of the use of the design can help develop students' reasoning about the data and the statistical distribution of statistical data. While [8] developed the reasoning capabilities statistically students about the sampling distribution.

With regard to the ability of statistical reasoning, [9] argued that the reasoning ability statistics is the ability to draw conclusions and provide an explanation based on the orientation of the data by observing the procedures structured, unstructured, and statistical concepts and provide critical commentary on the process or outcome statistics. [5] says that the reasoning ability statistical refers to the ability to understand and integrate the data and make decisions based on the context of statistics.

The Ability Reasoning Statistical

Identify reasoning abilities statistically on students [10] outlines an example in the matter of statistics to develop reasoning ability statistical namely:

1. Reasoning about the data is to identify and categorize the data to be quantitative or qualitative, discrete or continuous, and knowing how the type of data suitable for display on a table or diagram.
2. Reasoning about data representation is to understand how the withdrawal of a representative sample of a population, how to modify the chart to represent the data; able to see the signs at random from a distribution about common characteristics such as shape, inclination, the size of the center, and the size of the deployment.
3. Reasoning about the size of the statistics is to understand the size of the symptoms of the center, the size of the layout, and size distribution of the data, describe the different things about the data; know which one is the best to use in different conditions, find out why the recapitulation for the prediction of a large sample size data is more accurate than a small sample; know why recapitulation center size and the spread is useful to compare the data.
4. Reasoning about the opportunities is to understand secret true ideas of randomness (random), odds and probability to make decisions neighbor uncertain events, knowing the different events can be determined using methods differently.
5. Reasoning about the samples was to determine the relationship of samples with population and what can be inferred from a sample, find out why the sample was chosen will more accurately represent the population and why is there a way to select a sample that makes representative of the population.
6. Reasoning about the association is to know how to assess and interpret the relationship between two variables does not mean that one causes the other.

levels of Reasoning Statistical

According to [5] a model of reasoning statistically has five levels and arranged hierarchically as follows:

a. Idiosyncratic Reasoning
   Knowing symbols and terms of statistics, but do not understand its use, For example, students have studied the mean, median, and standard deviation as a measure of a summary of the data, but its use is not true, as compared with standard average standard deviation.
b. Verbal Reasoning
   Having a verbal understanding of some concepts, but can not apply it. For example, students can define a concept with precise but understanding the concept in incomplete has, as to why averagely is greater than the median in the distribution *skewed*
c. Transitional Reasoning

Having the ability to identify correctly some of the concepts of statistics, but the understanding of these concepts are not integrated as a whole / thorough. For example, an understanding of the concept of sample size, the larger the size of a sample of the more narrow confidence interval produced, the smaller the *standard error of* the more narrow anyway confidence intervals generated.

d. Procedural Reasoning

Having the ability to correctly identify the concepts of statistics, but the application of the concept was not yet fully integrated. For example, someone who has the ability to calculate the correlation correctly but has not been able to explain fully why the use of the concept.

e. Process Integrated Reasoning

Having a complete understanding of the concepts of statistics, relations with other concepts and applications, and able to provide an explanation of a concept by using the phrase own. For example, someone who can explain the true meaning and confidence interval of 95% in relation to the sampling process.

Some of the research results which seeks to develop reasoning statistical in students, including [7]developed the reasoning statistically students about data and data distribution statistics using Special design workshop into statistics. As a result of the maximum of the design can help develop students' reasoning about the data and the statistical distribution of statistical data.

Why Can Contextual Learning Develop Reasoning Skills Statistically Junior Secondary Students?

In contextual teaching and learning requires the interaction between students and students, students ith teachers, and student-teacher teaching materials. In this case obtained maximum student understanding, and students are given the opportunity to communicate the processed thought to his friend. In addition to the students' self-confidence built as well as socializing culture among students, students respect each other and are more independent. According to [10], learning statistics by using a contextual approach is able to construct knowledge of the students into patterns that are meaningful and useful so have understanding and skills in dealing with a problem.

In the contextual teaching and learning, students are encouraged to seek and find a relation between abstract ideas with applications in everyday life. Students internalize the concept through the discovery, empowerment, and connectedness. Contextual teaching and learning require teamwork both in the classroom and laboratory. So as statistical learning is contextual statistical learning with the contextual approach in which students are encouraged to link the statistical material learned in real life everyday student, both in the family, school or community with the aim to discover the meaning of the material to life. The learning process takes place naturally in the form of student activities work and experience, not just a transfer of knowledge from teacher to student. Furthermore [11] based on the results of research suggests that in order to understand and improve the statistical reasoning of students, carried out by integrating the three approaches, namely the approach of theoretical studies, empirical studies, and research-based classroom. Relation to the three approaches, suggests a model of learning environments to help students develop reasoning statistical appropriately be evaluated in future research.

To be able to implement contextual learning, teachers in learning the link between the material to be taught to the real world of students and encourage students to make the relationship between the knowledge possessed by the application in their lives daily, involving seven major components CTL namely [12]:

a. Philosophical constructivism (Constructivism)

Learning characterized by constructivism emphasizing its own understanding of active, creative, and productive based on knowledge and knowledge of the past and meaningful learning experiences. Knowledge is not a set of facts, concepts, and rules that are ready practiced. Man must first construct the knowledge and give meaning through real experience. Therefore students have to get used to solving problems, find something useful for themselves, and develop ideas in him.

b. Giving priority to investigate activities (Inquiry)

Component finds a core activity of CTL. This activity starts from the observation of the phenomenon, followed by activities to generate meaningful findings obtained by the students. Thus, the knowledge and skills gained from the results of the students are not given the set of facts that it faces.

c. Prioritize the activities asked (Questioning)

This component is a learning strategy CTL. Learning in learning CTL seen as an attempt teachers can encourage students to know something, directing students to obtain information, as well as determine the development of students' thinking skills. On the other hand, the reality shows that someone is always acquired knowledge stems from asking.

d. Creating a learning community *(Learning* Community)

This concept suggests that the study results should be obtained from the cooperation with others. This means that the learning outcomes to be gained by sharing between friends, between groups, and between the know to who did not know, both inside and outside the classroom. In the class through two-way communication between teachers and students or between students and student

e. Modeling

These components suggest that learning certain skills and knowledge followed with a model that can be replicated, students. The model in question may be a provision, for instance, an example of how to operate things, showing the work, showing an appearance. How this kind of learning will be more quickly understood the students rather than simply telling or explaining to the students without demonstrated a model or example

f. Reflection

component which is an important part of the CTL is a reflection back on the new knowledge learned, analyzing and responding to all the events, activities, or experiences that occur in learning, even to provide feedback or suggestions if necessary, students will realize that their newly acquired knowledge is an enrichment even revision of the knowledge that has been previously owned. This kind of critical awareness imparted to the students that he be open to new knowledge.

g. Assessment of learning authentic *(Authentic* Assessment)

This component is the process of collecting a variety of data that can give an idea or information on the development of students' learning experiences. Thus authentic assessment directed at the process of observing, analyzing, and interpreting data that has been accumulated during or in the process of student learning takes place. So that an assessment which is based on learning outcomes for real students can do which include an assessment of the progress (the process) and learning outcomes.

The theory of constructivism states that in order to gain a deep understanding requires learning methods that let students investigate freely, under conditions of a realistic and meaningful context. This involves two conditions, namely the investigation of personal and context of complex and full of meaning. There are five key features that arise from the use of context in the process of teaching and evaluation, namely practise significant, complexity and challenges, the relevance and motivation, linkages and transfer, as well as empowering students [12], Here there are three characteristics in statistical contextual learning namely:

1. The starting point of the learning process is the use of real-life problem-context (contextual) concrete or that is in the realm of thought students. The problems that exist can be presented with stories, symbols, models, or images. In this case, the student is expected to find means of statistical or statistical models as well understanding concept or principle.
2. This study avoids mechanical way that is focused on problem-solving procedure. Even so yet fully may be applied because they can not be removed, so that in practice is still common though not dominant. Students are expected to find tools or statistical models to be able to resolve the problem.
3. Students are treated as active participants were given the freedom to find their own or develop tools, models, and statistical understanding through discovery with the help teacher or discussion

with friends. These learning activities can be carried out by a group discussion among students with adult or peer. This interaction can be accommodated through learning in heterogeneous groups (a cooperative group comprising 2-6 people). According to Slavin, it in can lead to students who are capable of "weak" can learn from thinking their peers to have the ability to "more" so that learning will feel easy.

4. *Conclusions*

Contextual learning *(Contextual Teaching and* Learning) is the concept of learning that brings the real world into the classroom and encourages students to make connections between knowledge possessed by its application in everyday life, students gain knowledge and skills from the context, and of the process of constructing its own as a basis for solving problems in their lives as members of society. Statistical learning with the contextual approach in which students are encouraged to link the statistical material learned in real life everyday student, both in the family, school or community with the aim to discover the meaning of the material to life.

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