

Phenomenology Analytical Thinking With Open Approach Of Students According To The Assessment Of Learning Mathematics In The 21st Century

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ABSTRACT: The objective of this article is to describe the phenomenology of analytical thinking with open method students based on the assessment of 21st-century mathematics learning, it was found that the phenomenology of analytical thinking with the open method of students was based on the assessment of learning. Know mathematics in the 21st century, both of which are 4 steps of the Open Approach in math class. It is characterized by a phenomenology, ideology, mentioned as an independent idea of the subject to be studied. To describe the meaning that is built into the conscious mind, the student must not have prejudice. And there is no bias in the subject studied by eliminating one's opinion from what we are studying (bracketing) the focus on purpose. The intentionality and essence of a person's perception are believed that human beings can understand what is experienced through it. In summary, by linking math ideas for this step, teachers will allow students to display individual work or group work on the front board for students to join the class. Moreover, if possible, teachers are advised to show all student work. Although there may be jobs with similar or similar concepts. The work is not complete. Or works with errors Teachers should therefore be able to positively express the student's works or ideas, and then gradually. Correct incorrect ideas from exchanging and suggesting from fellow students.

Keywords: Phenomenology, Analytical Thinking, Open Method, 21st Century Mathematics Learning

INTRODUCTION

Nowadays the world has entered the 21st century for nearly two decades. It may cause people in the past to adapt not to keep up with the rapidly changing technological advances. The Partnership for 21st Century Skills presented the 21st Century Skills Concept to the Committee for creating the Lexicon of Contemporary Science. The Royal Academy has made an explanation as follows: 21st-century skills refer to a group of knowledge, skills, and work habits that are believed to be essential to the success of lifelong learning. These skills are the result of the development of the 21st Century Learning Framework (Bernie Trilling & Charles Fadel), the study of the 21st Century Concepts, the core of which is based on everyday life.

Hence, schools need to combine content and skills to better prepare students for the complex world. On the other hand, the 21st-century conceptual framework describes Analytical Thinking skills. Flexibility and ability to adapt leadership and cross-cultural learning skills Which is necessary for all students 21st-century Analytical Thinking skills empower all aspects of competition such as novelty, agility, and continuous improvement. The ability to change unconventional thinking Into innovation And ways to solve problems As well as the ability to achieve efforts, overcome obstacles, and bridging differences and relationships, the vision of Thai education reform in the second decade (2009-2018) stipulates that "Thai people can learn. Throughout life with quality "in particular, think of Can do problem-solving: have thinking and practice skills, ability to solve problems. Be creative Competitive Give reasons to distinguish between relationships. Which corresponds to essential concepts such as Analytical Thinking

Analytical Thinking is the cornerstone of life. A person who is capable of Analytical Thinking has other abilities. Above all other persons Both intelligence and life (Praphan Sirisawaraj, 2010) In learning mathematics, learners need to use analytical thinking as a tool to study and gain knowledge and understanding in various matters. Systematic (National Council of Teachers of Mathematics, 2000) students must read and understand problem-solving problems. Interpret the problem. Specify what the problem needs and understand the process of solving that problem to be able to solve problems However, found that students are unable to solve math problems This is because students cannot think critically. Discrimination Association of data correlation, rational relationship Causing unable to analyze the problem and choose a solution to solve the problem In line with the International Student Proficiency Exam, PISA (Programmed for International Student Assessment) is an exam to measure the level of learning among 15-year-old students around the world. PISA measures the ability and skills to apply the knowledge they have learned. In real life outside of school Considered a living skill and defined as literacy, PISA measures 3 aspects of literacy: Reading Literacy, Mathematical Literacy, and Scientific Literacy (IPST, 2017).

The results of the PISA test scores 2015 found that the mathematical assessment results, the OECD average score of math Having a standard score of 490, the mathematics average of Thai students is 415 in the range of

49-55, which is more than one level lower than the OECD average (IPST, 2018). In the mathematics assessment, only 1.4% of Thai students have. The ability to transform complex mathematical situations and use wildcards to help solve problems (IPST, 2017), and also, is consistent with the results of the National Education Test (O-NET) Grade Level at 6. The past 3 academic years (the academic year 2017-2019) found that the mean scores of the mathematics learning subjects had a continuous decrease in the average score as follows: The academic year 2016, mean score was 37.12, the academic year 2017, mean score was 37.50 and academic year In 2018, the average score was 32.90.

The authors analyzed the average drop in mathematics courses and found that the learning management process in most schools was unable to develop the learner quality, especially in the development of various forms of thinking skills and abilities. Like analytical thinking Creative thinking and problem solving, etc. General classes today Still lacking teaching and learning to develop skills 21st-century thinking is partly because student exams do not assess these potentials. The assessments and quizzes focus on measuring achievement rather than measuring skills arising from learning. The subjective test focuses on answering only knowledge, memory has not yet reached the stage for students to apply the knowledge they have studied for analysis. Synthesis and valuation in finding answers (Black and William, 1998) and in teaching and learning mathematics have not yet focused on the learning process. In the subject content and doing exercises to understand the content only (Maitree Inprasit, 2003). They studied computation rather than students' Analytical Thinking processes in the survey, analysis, interpretation, representation, hypothesis, and validation (Kouba & Franklin, 1993), Inprasitha (2011). It said that most of the classes still use a content-based teaching method. Overlooked the importance of the learning process and overlooked attitudes that affect students' learning with understanding;

INNOVATIVE LEARNING WITH AN OPEN APPROACH

The open method has its roots in Japan some 40 years ago with research on the assessment of advanced thinking in mathematics studies. Open-ended questions were used in the teaching and learning of mathematics (Becker & Shimada, 1997), which later Nodha (2000) called the method of teaching and learning Open Approach. This approach focuses on students solving open-ended problems that they are not familiar with. The nature of the closed-ended problem used can be solved by multiple methods or with more than one solution from one presentation of the main open-ended problem with multiple possible and incomplete solutions that lead to it. The experience of discovering new things. While trying to solve the aforementioned open-ended situation. The mathematical activities performed through the use of open-ended questions are varied, enabling teachers to assess students' advanced thinking skills, Shimada (1997).

Maitree Inprasit (2006) explains the details of the four steps of the open method in math class as follows:

1. An open-ended problem scenario presentation Students are often asked questions such as what students discover: what properties, relationships, rules, or methods when an open problem situation has been presented to the class. These questions may confuse some students. Especially in the early stages of using the open method, possibly due to unfamiliar mathematical terminology or do not know how to respond to such questions So they didn't know what they were expected to do. This is to help students understand the meaning of problem situations. This may be done by encouraging students to focus on a particular point in common from overhead projectors and well-prepared transparencies.
2. Student self-learning This is because the open method gives a high emphasis or emphasis to the mathematical thinking of each student. Which teachers should be careful not to However because open methods do not look for just one way or another way to solve a problem. If it is a new thing or perspective To solve the problem rather than This takes place in the second stage of this open-ended approach that allows each student to learn by exchanging ideas with each other. It is important in the open method to link from individual learning to collaborative learning with a group.
3. Discussion and comparison in the classroom. It is important to record each student's ideas or have written works showing traces of thinking in solving a problem in each group Therefore, using notebooks or worksheets will make it easier for students to record their ideas, and keeping group work after class provides evidence for teachers to use in assessing individual and group learning. As well the learning activities at this stage are considered very important in creating the next lesson. The teacher must try to identify students who do not yet understand the situation. They need some advice or more examples to encourage them to think about the situation and problem. The teacher should thoroughly observe the work of each group of students in the classroom. The right time to assign students to problem-solving will help students complete the task in the allotted time.
4. Conclusion from Mating Math Ideas For this step, the teacher allows students to display individual work or group work on the front board for students to join the class. Moreover, if possible, teachers are advised to show all student work. Although there may be jobs with similar or similar concepts. The work is not complete. Or works with errors Teachers should therefore be able to positively express the student's works or ideas, and then gradually. Correct incorrect ideas from exchanging and suggesting from fellow students. Maitree Inprasit (2003) defined the open method as a teaching method. One that promotes high-level

mathematical thinking that emphasizes problem-solving as a means of cognitive development. And thinking skills of the learners Learners can discover formulas, rules, and mathematical principles by themselves. This helps to expand the meaning of self-learning. Ladda Sila Noi (2006) has meant that The process of organizing activities or Various situations To have an open problematic nature to encourage learners to think by Problem Solving Scenarios The open method is a new kind of teaching, problem-solving teaching, and investigative teaching. But the teaching and learning activities used in writing a learning management plan require considerable thinking process for both teachers and learners. Narumol Inprasit (2009) said that the open method of learning management Usually begins with the use of an open-ended problem (Open-ended problem) that consists of three situations that teachers give students: Situation (A) is the situation, the problem that the teacher assigns the students. Situation (B) is when the students are faced with the problem. The learner must investigate, try to find a solution to a problem that the teacher has set for a situation (C) is a situation in which the teacher encourages the learner to try to solve a new and more advanced problem. Nohda (1986) said an open approach. It is a method that helps learners and teachers change their attitudes and beliefs about mathematics by developing the analytical, knowledge transfer and instinctive linking of the learner's thinking process. And engaging communication in an open way Suladda Loyfa (2009) discussed the open method that the open approach refers to a teaching process aimed at equipping learners with problem-like situations that stimulate analytical thinking and seek solutions to problem-solving. Able to create new problems from such problems with experience in problem-solving. Develop thinking process skills Phaijit Sanamakarn (2010) has defined An open approach refers to a teaching activity in which teachers try to understand as much of the learners' diverse thinking as possible by having the student speak to describe his or her thoughts with their peers or with the teacher and encourage the student to explain their thoughts. study Explain how to solve problems using an open method, assuming three principles: 1) Independence in activity Teachers using an open method hope that learners can learn from being independent. In applying Self-activity 2) the evolution and nature of Knowledge integration and 3) The decision-making ability of teachers who often confront learner ideas that the teacher had never thought of before. The main role of teachers is to allow learners to express their thoughts perfectly and to help them. Other students Anyone can understand the idea. From this definition, it can be concluded that the Open Approach refers to the process of organizing activities or situations. To have a look at the problem that is open to finding solutions. There are several correct answers. Or is there a way to find the answer There are several ways to get into the answer to the problem? Motivate students to think by defining the situation in 3 ways under the concept of Narumon Inprasit (2008) adopted an open method for mathematics classrooms as follows.

Step 1 Scenario A Problem situation that the teacher assigns to learners.

Step 2 Situation B When the student is faced with a problem. Learners must search for solutions to problems that the teacher provides.

Step 3 Scenario C Situation where the teacher asks students to try to solve a new and more advanced problem

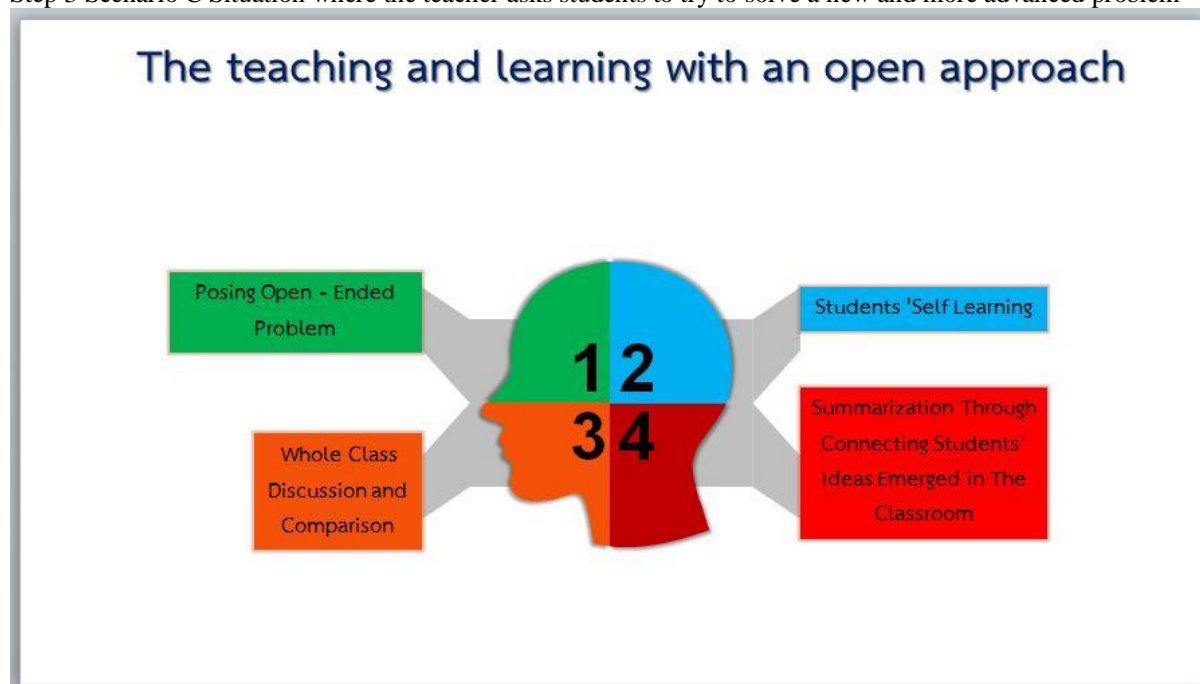


Figure 1: Management of teaching and learning using the Open Approach

Source: Maitree Inprasit. 2003.

However, Maitree Inprasit (2018) has presented a framework for assessing 21st-century mathematics learning with 6 issues: 1) Set a framework for assessment in each period by anticipating the learners' ideas. 2) Creating a tool to assist in assessment, such as creating instruction, designing materials based on the student's concept, using the instruction book in the textbook. 3) Assessment to connect with prior knowledge by linking the concepts of the previous learners, what will be used to solve problems according to the learner's concept. 4) Determining the position to be assessed in each class to be used in observing the learners' ideas. 5) Collect evidence from assessments using field recordings, VDO, or photography. 6) Using information to reflect results to assess the cognitive development of learners.

Which of the above 6 steps can be classified into 3 categories as follows Category 1: Planning, including (a) Set a framework for assessment in each period by anticipating the learners' ideas? (b) Creating a tool to assist in assessment, such as creating instruction, designing materials based on the student's concept, using the instruction book in the textbook. (c) Assessment to connect with prior knowledge by linking the concepts of the previous learners, what will be used to solve problems according to the learner's concept. Category 2 implementation, consisting of (d) Determining the position to be assessed in each class to be used in observing the learners' ideas. (e) Collect evidence from an assessment using field recording, VDO, or photography. Category 3: reflection, consisting of (f) Using information to reflect results to assess the cognitive development of learners. The large conceptual framework will act as a driving mechanism to assess learning and to develop errors from the framework. Then, the researchers studied the analytical thinking skills of the learners, which consisted of five skills: comparison, categorization, error classification, inference, and application.

THE MAIN CHARACTERISTICS OF THOUGHTFUL CLASSES

The human body is made up of two parts: the body and the mind or mind. The mind performs three functions: thinking, feeling, and wanting (wanting), and directing the body to act. (behavior) Therefore, the behavior that occurs in the function of the human mind is different from other animals. Humans can think. Thinking is a tool used by humans to live. It can be considered an important tool (Baron and Sternberg, 1987).

Quality thinking has a direct effect on the quality of life, ie there are two colors of thinking: green and red. Green thinking is first-level thinking. Thinking without evaluating what you think, and red thinking is high-level thinking. There is a pause to assess what we think and then continue thinking like driving a car. When the car comes running, there is a red light, the car must stop while the car is stopped. The driver will have time to look left and right. See if you come in the right direction or not Before driving Thinking in red has a multi-step thinking process, so thinking productivity is of quality and can be utilized.

Weinstein and Mignano (1993) Thinking Class is a class with a thinking-focused learning environment. It is a class that is different from the general class in 3 ways:

1. Consistently creating knowledge using high-level thinking
 2. To bond with the subject studied by using wisdom and careful reflection.
 3. Standards of Knowledge Building And learning based on the fact that can be proven correct.
- These 3 characteristics will be integrated into all behavior of students and teachers. Every teaching activity and every problem situation Which can be noticed Thinking classes are therefore not a place where learners come to listen to information or lessons and save them, wait for the time to call them out. But it is a place where knowledge Meaning and understanding are built through a continuous high-level thinking process.

MATHEMATICS LEARNING SUBJECT

The Mathematics Subject Group aims to educate all youths to continually learn mathematics as possible by defining essential subjects for all students. (Ministry of Education, 2008, pages 56-57) as follows.

1. Number and execution Concepts and number sense Real number system Real numbers Implementation of the number, percentage ratio, number solution, And the use of numbers in real life
2. Measurement of Length, Distance, Weight, Area, Volume and Capacity, Money and Time, Units of Measure, Different Systems, Predictions about Measurement. Trigonometric ratios Solving measurement problems and applying measurement knowledge in different situations
3. Geometry, geometry and properties of one-dimensional, two-dimensional geometry and three-dimensional visualization Geometric model Geometric theorem Geometric transformation in parallel scrolls. (Translation) Reflection and Rotation
4. Algebra, Pattern, Relationship, Function, Set and Operation of Set, Reasoning, Expression, System, Inequality, Graph, Arithmetic Sequence, Sequence, Geometry, Series, Arithmetic And geometric series
5. Data Analysis and Probability Setting the issue Writing questions and setting the study methods Data collection Organization of information systems Presentation of data, median and distribution of information. Data analysis and interpretation Probability opinion poll Using statistical knowledge and probability to describe events and assist in making decisions in everyday life.

6. Mathematical Skills and Processes Problem-solving in a variety of ways, reasoning, communicating, communicating mathematical meaning, and presenting various knowledge connections. Mathematical And linking mathematics with other sciences and creativity.

MATHEMATICS ASSESSMENT IN THE 21ST CENTURY

The current learning measurement and evaluation system, primarily testing, cannot lead students to 21st-century skills, as most of the exams are remembered and focused, but the content is not measured by type and level of behavior. Specified according to the standard of course learning indicators are the cognitive domain measurement category identifies the level of behavior to be identified from memory, comprehension, application, and application. Analysis and criticism Synthesis And valuation Measurements for different types of practical skills (Psychomotor domains) identified the behavioral levels to be maintained from the copying follow the pattern without looking at the pattern. Achieving results that meet the goals every time Making quality results every time And applying it in situations As well And the measure of attitude and personality type to work (Affective domain) identified the level of behavior to be classified from awareness and response. The birth of values Bringing knowledge and values To organize work systems and express themselves as a practice, it is necessary to develop a high-quality measuring tool that meets the type and level of behavior required by the standard of course learning indicators to measure. Measurement results are not used to indicate possible results or falls. Rather, it should be used to assess the progress of students' learning development to achieve a consistent qualitative balance, better development in the same direction in terms of knowledge, competence, work skills. And attitude and personality towards work

Therefore, the results should be measured and assessed for consistency in all 3 areas, there will be no conflict of any one side. It is an anomaly that teachers need to meet to find solutions to accelerate the development of non-development areas so that it will be a qualitative balance assessment. 21st-century skills assessment has the focus on 1) balance. In the qualitative evaluation, 2) focus on the benefits of reflections from the learners' practice to improve work, 3) use technology to enhance testing, measure, and evaluate results for maximum efficiency, and 4) build and develop a file system. The student's work to be standardized and of high quality. Specific quality criteria All assessments must meet certain criteria, which are to have a clear objective of the assessment. Have clear and appropriate learning objectives There is a suitable evaluation method. Having a personal personality like a good practice And the assessment must be accurate based on bias and perversion. This is the principle of learner-centered assessment. Academic performance and achievement are almost the same as the average learner's performance based on standardized tests. Some of the quizzes claim to be able to assess 21st-century skills because of the questionnaire form. It has to be written responses, not from four or five options, but with real work, the context that needs to be applied in real life, and the test taker's real-world environment, but the 21st century can't return to the original quiz to harmonize when tried. Considering the difference between what is expected from the learner, the approach we test for 21st-century skills presents a framework that includes both the reasons and the benefits of the skills required for the learner. That is independent of needs and fears to stakeholders, including teachers, parents. He sees content knowledge as an integral part of education, but the themes need to include disease awareness, creativity, innovation, analytical skills, communication, collaboration, initiative, and self-direction. Leader and responsibility

While the 21st century has been conditioned on all the same standards of the same quizzes and quizzes as the determinants of the assessment behind the scenes, it has not been released from the 20th century. In the 21st century, there is a need to inject differentiation, no uniform standardized environment, there are variations and changes. Variation does not necessarily mean good or bad, but rather a reflection of the complexity of the work. For example, some groups need more time to complete their tasks, just as others want to spend more time analyzing options. The more challenging the appraisal or the more variable the work environment will be. The less appropriate the one-standard test is, the less appropriate the assessor needs to be smart enough to know and score Analytical Thinking, creative thinking, Analytical Thinking, and problem-solving skills. Therefore, teachers must be entrusted with decisions that allow variations in terms of time, context, and performance assessment processes (Hargreaves and Shirley, 2009).

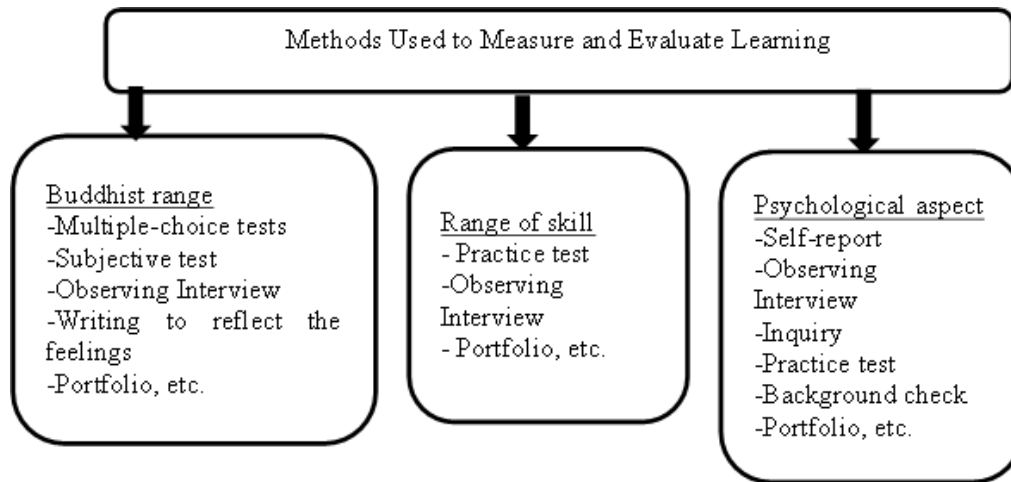


Figure 2: Methods used to measure and evaluate learning outcomes
Source: Author. 2021.

PHENOMENOLOGY IN ANALYTICAL THINKING

Phenomenological studies It is a type of qualitative research rooted in philosophical studies and later used in social science research and the development of qualitative research in our home. One reason is that qualitative research has taken the fundamental concept of philosophy in the study (Walter A.J. 1999). It is a study based on the concept of the West. The method is flexible but complex and controversial in terms of the reliability of the findings. Thus, enabling research-oriented Quality is limited However, there have been researchers. Try to study and understand the research. More of this type to be able to respond to knowledge Academic who cannot answer questions based on quantitative research. Each of which is different. The authors must interpret the experience according to the perceptions of those who live in the situation independently of any theoretical ideas.

Definition of Phenomenology (Phenomenology) comes from the Greek Phenomenon means to appear (appearance) and the word Logos for rational consideration. Phenomenological paradigm Focus on Human life experience Focuses on thinking about life experiences of the same people. (Omery A. 1983) Phenomenologists often ask, "What is the essence of these people's experiences?" Or "What is the meaning of these people's experiences?" Phenomenology of people with that experience. "The study of phenomenology has been developed in 3 phases (Holloway I., & Wheeler S. 1996) as follows.

In the first phase (Preparatory phase), the main player in this phase, Franz Brentano, between 1838-1917. The important thing of this age is to Focus on actions and understand Deepen the value of the inner perception of a person (value of inner perception), especially the psychological concept of a person's past perception. And to focus on the inner and outer perception of the person (Interior perception is impossible without exterior perception). In this phase, there is also Carl Stumpf, Franz Brentano's disciple who has studied scientific phenomena. With an emphasis on scientific methods, this stage can be regarded as the foundation of the study of later phenomenology.

In the second phase (German or second phase), the main actors of this phase are Edmund Husserl (1859-1938) and Martin Heidegger (1889-1976). Searching for the apparent truth without foreseeing the student is independent of conceptual or theoretical frameworks, with individuals explaining the stories and experiences they experience through their senses.

The third phase (French or third phase) is the phase in which the study of phenomenology has moved. From Germany to France, the main figures of this period were Gabriel Marcel (1889-1973), Jean-Paul Sartre (1905-1980), and Maurice Merleau-Ponty (1908-1961). Comes from the perception of Things are alive in real experiences and have It is a key figure in the study of interpretive phenomenology, with an emphasis on language, hermeneutic circle, dialogue, and shaping an understanding of that thought process.

The concept of schools of phenomenology has 3 characteristics (Holloway I., & Wheeler S. 1996):

1. Duquesne school has an educational approach. Based on Husserl's eidetic structure with a focus on the notion of description, this kind of study was developed by researchers such as Colaizzi (Giorgi). And Van Kaam.
2. Heideggerian Hermeneutic approaches studies using phenomena interpretation. (Interpretation of phenomena), which has been popular It is used as a guide to understanding the common meaning to assist individuals, researchers in this group are Dykelmann, Allen, and Tanner (Diekelmann, Allen & Tanner). Tanner) Leonard and Benner
3. Dutch schools have an educational approach that combines description and interpretation. Apply sociological studies to discover the world 'secret' and intimacies through asking and explaining. The

researchers who used study 7 were Van Manen, among others. The standpoint of phenomenology is different and can be divided into 3 approaches as follows.

1. Transcendental Phenomenology is the idea of Edmund Husserl, the Husserlian Phenomenology concept. It is a thought that arises independently of the desired subject. Studying the essence of this concept is to portray the meaning generated in the conscious mind. The study of this concept must not be prejudiced. And there is no bias in the subject studied by eliminating their opinions from What you are studying (bracketing) focuses on the intentionality and essences of the person's perception. There is a belief that humans understand what is experienced by being aware
2. Existential Phenomenology, based on the concept of Maurice Merleau-Ponty and Jean-Paul Satre that the existence of a person's world influences that person. People and things Believing that the perception of a person Affects our existence in the world as well the present life is the result of each person's historical background and experience.
3. Hermeneutic Phenomenology based on Heidegger's concept. Phenomenology Become an interpretive phenomenon (Hermeneutic Phenomenology or Interpretive Phenomenology) that focuses on interpretation. The meaning of a person's experience is primarily a contradiction with Husserl's viewpoint of separation. He leaves the subject being studied, believing that being is, timing has a meaning that can be interpreted and that language is very important in the interpretation that the student must-have. Understanding the person's environment (Leonard V. W. A 1989), therefore, the author is unable to separate himself from the study.
4. The study of interpretive phenomenology (Hermeneutic Phenomenology) believes that individuals are very important to education. Each person will have a sense of their own experiences, which are unique experiences of the individual (Heidegger M. 1962) and expressing meaningful thoughts of each person that may be different from others. The main characteristics are First The person as having a world (The person as having a world) means that a person has a relationship with the environment around him since birth and cannot be separated. The environment here is language, culture, living in the context of that person. The writing should have a good understanding of the study environment. Second, the person as being for whom things significance and value means the person who gives meaning to things. According to environment Language and Culture Basic attributes of each person are expressed through perception. And experience the researcher should focus on their perception and understanding of the individual in that context. Third, the person as self-interpreting means the person as the contributor. Meaning according to their thoughts and experiences Without theories Is the specific perception of People according to their background focus Fourth, the person as embodied means that the person has characteristics. Of the integration of thoughts, the meaning of the life plan consists of physical, mental, and social under related environments. Cannot be separated into parts
5. The person in time means that the person lives according to the dimension of time and according to the life experience gained from the past which can affect the future. The concept of phenomenology studies has an important element: Descriptive and Interpretation (Husserl E. 1965) to illustrate and write the experience of life. That understanding is in the way of life and resonates in the sound of a person's experience. According to the status quo can be said That a phenomenon understands the meaning of a person or the substance of an experience of life on earth by giving importance to the understanding of experience. Rather than explaining the reasons for the experience. Although the concept of studying phenomena has a different focus, all phenomena share one characteristic: the rejection of empirical realism, which believes that what is true must be something that can be perceived by a nerve. Only touch But in the viewpoint of a phenomenologist, what is true is not necessarily what can be. It is always perceived by the senses, but many things can be reached through intuition through the understanding of the feelings or things within a person's mind. The same kind has the same essence (essence) may be called Is the same structure According to the meaning that people understand together or understand together from the study of the common nature of the same experience from people. Many people may conclude that the study of the phenomenon Husserl's conceptual neurology is Post positivism, and Heidegger's conceptual study of phenomenology is Constructivism.

CONCLUSION

Nowadays the world has entered the 21st century for nearly two decades. It may cause people in the past to adapt not to keep up with the rapidly changing technological advances. The Partnership for 21st Century Skills presented the 21st Century Skills Concept to the Committee for creating the Lexicon of Contemporary Science. The Royal Academy has made an explanation as follows: 21st-century skills refer to a group of knowledge, skills, and work habits that are believed to be essential to the success of lifelong learning. These skills are the result of the development of the 21st Century Learning Framework (Bernie Trilling & Charles Fadel), the study of the 21st Century Concepts, the core of which is based on everyday life.

Looking back on the phenomenon of Analytical Thinking with an open approach to students based on the 21st Century Mathematics Learning Assessment, the four phases of the open method in the mathematics classroom. It is characterized by the nature of the phenomenon, science, and vision, which is described as an idea that arises independently of the desired subject. Studying the essence of this concept is to portray the meaning generated in the conscious mind. The study of this concept must not be prejudiced. And there is no bias in the subject studied by eliminating their opinions from What we are studying (bracketing) focuses on the intentionality and essences of the person's perception. To understand what is experienced by being aware Presentation of an open problem situation Students are often asked questions such as what students discover, what properties, relationships, rules, or methods when an open problem situation has been presented to the class. These questions may confuse some students. Especially in the early stages of using the open method, possibly due to unfamiliar mathematical terminology or do not know how to respond to such questions So they didn't know what they were expected to do. This is to help students understand the meaning of problem situations. This may be done by encouraging students to focus on a particular point in common from overhead projectors and well-prepared transparencies. And self-study of students This is because the open method gives a high emphasis or emphasis to the mathematical thinking of each student. Which teachers should be careful not to However because open methods do not look for just one way or another way to solve a problem. If it is a new thing or perspective To solve the problem rather than This takes place in the second stage of this open-ended approach that allows each student to learn by exchanging ideas with each other. It is important in the open method to link from individual learning to collaborative learning with a group. Because of discussion and comparison in the classroom, It is important to record each student's ideas or have written works showing traces of thinking in solving a problem in each group Therefore, using notebooks or worksheets will make it easier for students to record their ideas, and keeping group work after class provides evidence for teachers to use in assessing individual and group learning. As well the learning activities at this stage are very important in the construction of the lesson. In the future, teachers must try to identify which students do not yet understand the situation. They need some advice or more examples to encourage them to think about the situation and problem. The teacher should thoroughly observe the work of each group of students in the classroom. The right time to assign students to problem-solving will help students complete the task in the allotted time. In summary, by linking math ideas for this step, teachers will allow students to display individual work or group work on the front board for students to join the class. Moreover, if possible, teachers are advised to show all student work. Although there may be jobs with similar or similar concepts. The work is not complete. Or works with errors Teachers should therefore be able to positively express the student's works or ideas, and then gradually. Correct incorrect ideas from exchanging and suggesting from fellow students.

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