Design of Social Learning Environment as Inquiry-Based on Cloud Technology for Enhancing the Critical Thinking Skill and Collaborative Learning

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Abstract—In the age of social learning environment, the cloud online technology Besides, it was required to facilitate the students' learning in the 21st century. The objective of this study was to design the social learning environment as inquiry-based on cloud technology for enhancing the critical thinking skills and collaborative learning by using technique in evaluating as well as accrediting the tentative model developed by the experts in order to synthesize into conceptual framework of design. Then, the obtained data were explained, interpreted, and concluded. According to research findings, found that the model of social learning environment inquiry-based on cloud technology, was appropriate and practical for being applied in real practice in "the Highest" level. It was supported by learning management for enhancing the critical thinking skills, collaborative learning, and higher education learning context which were appropriate in "the Highest" level. The appropriateness of details in tentative model in the step and instructional activity, was in "the Highest" level. The major factors of the model of social learning environment inquiry-based on cloud technology, were online technology base, learning theories base context base, critical thinking base and inquiry – based learning on cloud technology.

Index Terms—Based on cloud environment, critical thinking skills, collaborative learning, social learning.

I. INTRODUCTION

The livelihood in the 21st century as complex age as well as rapid change of knowledge and technology, caused various countries to develop their human resources to have quality as well as be human power or Knowledge worker who used intelligence for moving their countries. Consequently, the Education was an important instrument to help in preparing people's readiness as well as immunity to face with different changes shrewdly, and be able to adapt themselves appropriately. Therefore, the learning environmental management for people in the 21st period was not only to prepare one's knowledge to be taken by learner in Passive form, but also the learning situation for enhancing the students' higher-order thinking process, knowledge searching skill, coping and using body of knowledge based on real context, knowing how to work for both of team and individual learning, and supporting the communication with community as well as participation among various nations in direct and online learning,

obtaining knowledge and skill for being able to live, work, and adjust with economic situation in present world society especially the learning skill and innovation as 3 R, and 4 C including the following aspects: Reading, Writing, and Arithmetic and 4 C including: Critical Thinking, Communication, Collaboration, and Creativity which included the life skill and occupation, information technology, media and technology skills, and new Educational Management. Recently, the online learning management was expanded widely in higher education learning. The number of students who enrolled in the program using the online lessons in various courses, was increased more than the former educational sessions for 1.5% "Ref. [1]" simultaneously with technology progress of Web 2.0 returning to be Cloud Computing service in this form was well known including Google Apps. In this study, the researcher applied Apps for Education as the instrument for designing the Social Learning Environment as Inquiry-based for enhancing the critical thinking skills, and collaborative learning which played an important role in changing the image of organizations in Educational Innovation as well as communication in different Educational Institutions. As a result, the teachers could follow up their students more closely. The students were able to learn according to the programs. The expenditure of Educational Institute could be alleviated. Besides, both of students and instructors were not only able to utilize the study in IT world, but also share their knowledge with each others from other institutions among the countries based on policy of ASEAN Economic Community. It was supported with the national development during the Developmental Plan, Issue 11, giving an importance to development for humane beings and Thai society to have quality, opportunity to access resource as well as obtain benefit from Economic and Social Development equally, and to develop economic opportunity through knowledge base, technology, innovation, and creativity on the basis of production as well as consumption being friendly with the environment, and human development for higher-order of thinking in creation , production, and usage of information technology with critical thinking as well as keeping pace with important issues for national development during the age of Economic Knowledge-based Economic. This significance was specified in model scheme of National Information Technology (the 2nd Issue) of Thailand 2009-2013. For guidelines for learning environmental management by using the information technology, it was necessary to emphasize on the students to construct knowledge by Collaboration in problem solving as the online [2], which was supported by Social Constructivist Theory focusing on knowledge construction through the exchanging and sharing experience from other students.

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Then, they tried to associate the incidence as well as phenomenon they met by constructing the Cognitive Structure) which would affect the Higher Order Thinking Skills which was able to help the students to understand the situation and solve the complex problems. One form of instructional design based on Social Constructivist Theory which could promote the students' knowledge construction and thinking process, was the Inquiry Learning Model "Ref. [3]" presenting the technique to construct guidelines for using the internet learning source which would help the students to construct their body of knowledge through interaction with learning environment. The former research findings found that the knowledge discovery lessons, could support the collaborative learning in problem solving, developing one's critical thinking as well as social skill, and practicing one's real experience [4]. According to the study of "Ref. [5]", found that the designed knowledge discovery lessons were very efficient in integrating with teaching activity focusing on practice. Furthermore "Ref. [6]" concluded that there were 4 major factors in designing the knowledge discovery lessons as: critical thinking, knowledge application, social skills, and scaffolding learning. In the meanwhile, "Ref. [5]" proposed 3 important factors in designing the knowledge discovery lessons as: the student motivation and authenticity, the thinking skill development, and the cooperative learning.

It could be seen that the former research studies didn't have obvious model for organizing the Social Learning Environment as Cloud pattern. Moreover, the trend of Educational Management System would be changed from the study being occurred in schools or Educational Institutions, into Ubiquitous Education which the students were able to study by themselves every where. As a result, the construction of adequate experience from virtual surrounding as major factor for changing one's Educational paradigm which was the most influential factor through the online learning center as well as Cloud Technology. It was indispensable to study the experts' opinion on the design for Social Learning Environment as Inquiry-based on Cloud Environment for Enhancing the Critical Thinking Skill and Collaborative Learning in order to know the important factors and foundations for designing the Social Learning Environment as Inquiry-based on Cloud Environment so that the thinking skill as well as collaborative learning, and ICT using skill based on desirable characteristics of students in the 21st century would be efficiently developed further.

II.   RESEARCH OBJECTIVE

1) To design the Social Learning Environment as Inquiry-based on Cloud Environment for Enhancing the Critical Thinking Skill and Collaborative Learning.
2) To evaluate the Social Learning Environment as Inquiry-based on Cloud Environment for Enhancing the Critical Thinking Skill and Collaborative Learning.

III.   RESEARCH FRAMEWORK

The Conceptual Framework for the study of the Social Learning Environment as Inquiry-based on Cloud Environment for Enhancing the Critical Thinking Skill and Collaborative Learning, was shown in Fig. 1.
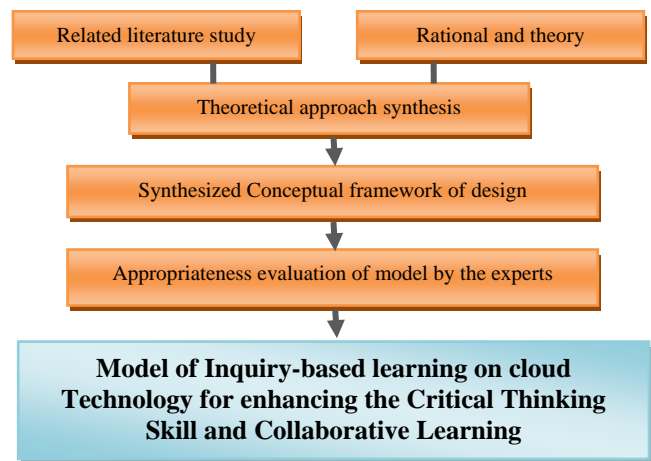

Fig. 1. Conceptual framework of the research: "the social learning environment as inquiry-based on cloud technology for enhancing the critical thinking skill and collaborative learning," was shown.

IV.   RESEARCH METHOD

1) The target group consisted of 10 experts in the design of learning environment, the Inquiry – based learning and teaching, the learning environment for enhancing the Collaborative Learning, learning cooperation, and the learning environment for enhancing the critical thinking. They were selected by Purposive Sampling by selecting from those who had experience as well as research studies in the above issues continuously at least 5 years.
2) The research design, was Survey Research by collecting both of Quantitative, and Qualitative Data.
3) The research instruments were the tentative model of the Social Learning Environment as Inquiry-based on Cloud Technology for Enhancing the Critical Thinking Skill and Collaborative Learning.
4) For data collection technique, the researcher presented synthesized tentative model of the Social Learning Environment as Inquiry-based on Cloud Technology for Enhancing the Critical Thinking Skill and Learning Cooperation, to 10 experts in order to investigate the Social Learning Environment as Inquiry-based on Cloud Technology for Enhancing the Critical Thinking Skill and Collaborative Learning through the interview, and small group conference.
5) For data analysis, the findings obtaining from model evaluation to be investigated in both of quantitative, and qualitative analysis by using statistical values as the Percentage, Mean, and Standard Deviation. Then, the obtained data were explained in 5 level as the lowest level 1-1.90, low level 1.91-2.70, moderate level 2.70-3.50, high level 3.51-4.30, and the highest level 4.31-5.00.

V.   RESEARCH CONCLUSION

1) The findings from tentative model study of the Social Learning Environment as Inquiry-based on Cloud Technology for Enhancing the Critical Thinking Skill and Learning Cooperation, found that the major characteristics of tentative model study of the Inquiry – based learning cloud Technology to Enhance Critical

Thinking Skill and Collaboration Learning, were as follows:

- The online learning characteristics considering from web-based learning which could cause the students' interaction in learning as well as communication. The content was presented in multi-media form. The learning class management system was administered. The students' learning responses were responded every time and place. In addition, the students' higher-order of thinking was promoted.

- The students' learning characteristics considering by the developed learning environment model, were relevant to various aspects of students' learning characteristics including: the cognitive domain, the social domain, the physical domain, and the students' personal characteristics.

- The inquiry-based learning was the basis from synthesis of Social-Constructivist Theory as the combined learning management design between the "Media," and "Method" by applying Constructivist Theory as foundation of design aligned with media including the media characteristics, and media symbolic system supporting the students' knowledge construction. The major factors and rationales using for the design, were as follows: 1) the problem situation, 2) the learning resources, 3) the scaffolding basis, 4) the collaborative problem solving, and 5) the coaching. For learning environment design based on Constructivist Theory, it would focus on development for students' independent thinking process as well as knowledge construction by cooperating with design of inquiry method enhancing the students to be curious, search for knowledge by asking questions, and try to find solutions by themselves. Besides, the inquiry teaching was defined in another way that it was a learning method by solving problems through the organized activities, and applying Scientific Methods to participate in the activities. The new phenomenon faced by the students each time, would stimulate the students' thought as well as observation with the inferred object clearly. They would invent, discover, and interpret the meaning under the most appropriate situation, using the subtle technique which could be reasonably justified as well as concluded.

- The critical thinking skill was a thinking principle emphasizing on the students' consideration process, and evaluation of evidence relating to every aspect of thinking issues carefully by using reasoning principles until the most appropriate or best answers would be found so that they would be used for decision making, evaluating, or solving various problems, and open ones' thinking guidelines into different solutions which would lead to the searching for more reasonable answers than the former solution.

- The cloud computing technique, the researchers administered Apps for Education as an instrument for designing the social environment as inquiry-based learning on cloud Technology enhancing critical thinking skill, and learning cooperation by playing an important role in changing the image of organization's Educational Innovation as well as communication in different Educational Institutions. As a result, the teachers could follow up their students more closely. Consequently, the students were able to learn according to the program which would alleviate the revenue of Educational Institutes.

TABLE I: THE FINDINGS OF EVALUATION IN TENTATIVE MODEL OF SOCIAL LEARNING ENVIRONMENT AS INQUIRY-BASED ON CLOUD TECHNOLOGY FOR ENHANCING THE CRITICAL THINKING SKILL AND COLLABORATIVE LEARNING WERE SHOWN

Details of the Model	Interpretation $\overline{X}$	S.D.	Level of appropriateness
Part 1: Details of Model in Social Learning Environment as Inquiry-based on Cloud Technology for Developing the Critical Thinking Skills and Collaborative Learning.			
A. What level the Principles and factors using as a basis for developing the tentative model were?	4.75	0.50	*The Highest*
B. What level were the objectives of Social Learning Environment as Inquiry-based on Cloud Technology in determining the students' characteristics needed to be appropriately developed with principles and approach of tentative model ?	4.75	0.50	*The Highest*
C. The learning and teaching process consisted of 2 steps as: 1) The preparation before learning and teaching. and 2) What level the appropriateness in step of learning and teaching process management was ?	5.00	0.00	*The Highest*
D. What level was the appropriateness of measurement and evaluation of tentative model of Social Learning Environment as Inquiry-based on Cloud Technology?	4.75	0.50	*The Highest*
Overall conclusions of Part 1, the details of tentative model of Social Learning Environment as Inquiry-based on Cloud Technology, were appropriate in level	4.81	0.12	*The Highest*
Part 2: The details of tentative model in parts of steps and instructional activities on Social Learning Environment as Inquiry.			
A. What level was the developed tentative model of Social Learning Environment as Inquiry-based on Cloud, was appropriate for developing the students' critical thinking ?	4.75	0.50	*The Highest*
B. What level was the developed tentative model of Social Learning Environment as Inquiry-based on Cloud, was appropriate for developing the students' collaborative Learning?	4.75	0.50	*The Highest*
C. What level the step and activity of the developed tentative model of Social Learning Environment as Inquiry-based on Cloud, were appropriate for developing the students' critical thinking skills?	4.75	0.50	*The Highest*
D. What level the step and activity of the developed tentative model of Social Learning Environment as Inquiry-based on Cloud, were appropriate for developing the students' collaborative learning?	4.75	0.50	*The Highest*
E. What level the developed tentative model of Social Learning Environment as Inquiry-based on Cloud, was practical?	4.50	0.58	*The Highest*
Overall conclusions of Part 2, the details of tentative model in the step and instructional activity of Social Learning Environment as Inquiry-based, were appropriate in level	4.70	0.11	*The Highest*

2) The detail findings from accredited evaluation for developing the tentative social learning environment, were shown in Table I.

- According to the findings of evaluation the model of Table I, Part 1, the appropriateness of details in tentative model of Social Learning Environment as Inquiry-based on Cloud for Enhancing the Students' Critical Thinking Skills, and Collaborative Learning, found that it was appropriate in "the Highest" level (X = 4.81) including the instructional process (X = 5.00), the used factor, objective of tentative model, and measurement and evaluation of tentative model (X = 4.75) respectively.

- According to the findings of evaluation the model of Table I, Part 2, the appropriateness of details in tentative model of the step and instructional activity of Social Learning Environment as Inquiry-based on, found that it was appropriate in "the Highest" level (X = 4.70) especially the developed tentative model of Social Learning Environment as Inquiry-based on Cloud, was appropriate for Enhancing the Students' Critical Thinking Skills, and Collaborative Learning, in "the Highest" level (X = 4.75). In addition, the developed tentative model of Social Learning Environment as Inquiry-based on Cloud was practical. It was found that the possibility was in "the Highest" level (X = 4.50) respectively.
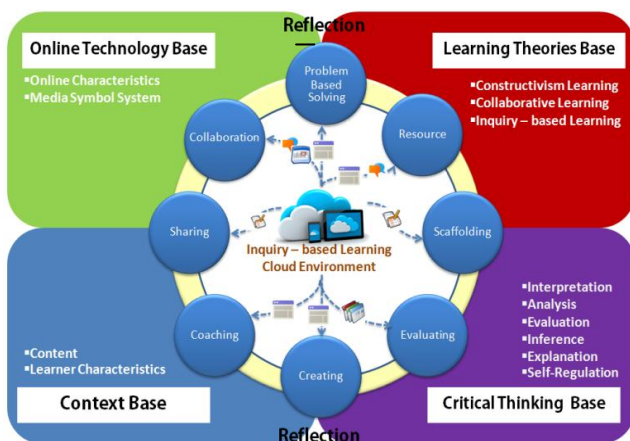

Fig. 2. The model learning environment on cloud technology for enhancing critical thinking skill and collaborative learning and ILEC model was synthesized from the theories relating to one's learning during the 21st century and capacity of cloud technology facilitating the application for efficient online learning.

VI. RESULT DISCUSSIONS

The above findings indicated the appropriateness of theoretical basis and factors of the environmental model of Social Learning Environment on Cloud Technology for Enhancing Critical Thinking Skill and Collaborative Learning developed by the researcher which were considered and reviewed by the experts, in "the Highest" level. The major factors were: 1) Problem based solving 2) Resource 3) Scaffolding 4) Evaluating 5) Creating 6) Coaching 7) Sharing 8) Collaboration. It was different from "Ref. [7]" proposing 7 principles for designing the online inquiry lesson. Furthermore, it was also different from presenting 6 factors of inquiry lesson and web-based lesson. Moreover, the findings were found that the ILCE

Model was able to develop the students' critical thinking and collaborative learning in "the Highest" level as well. In addition, the appropriateness of social learning environment and inquiry-based, found that it was appropriate in 'the Highest" level. It was supported by "Ref. [8]-[11]" who found that the online learning technology for students' development, had to be correct in order to develop one's higher-order of thinking, cooperative learning society, and knowledge searching skill. The important reason caused these research findings might be due to the ILCE Model was synthesized from the theories relating to one's learning during the 21st century including: Constructivism Learning, Collaborative Learning, Inquiry – based Learning, Critical Thinking as well as characteristic of characteristic and capacity of Cloud technology facilitating the application for efficient online learning because there were available instruments to serve for the design based on ILCE Model which could be used by designers or Educational Staffs easily, conveniently, and economically.

VII. FURTHER SUGGESTIONS

A. Recommendations for the Application of Findings

According to the development of Social Learning Environment on Cloud Technology for Enhancing Critical Thinking Skill and Collaborative Learning, the research findings could be used for developing the graduates' higher-order of thinking so that they would obtain the desirable characteristics further.

B. Recommendations for Future Research

1) The guidelines should be studied. The model of Social Learning Environment as Inquiry-based on Cloud Technology should be developed for enhancing the students' thinking process.
2) The research studies should be conducted for developing the Social Learning Environment as Inquiry-based on Cloud Technology should be developed in order to enhance the students' appropriate higher-order thinking by using as the instrument for developing students' thinking based on desirable characteristics of students during the 21st century to be efficient in the future.

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