The Proposition of an Online Collaboration Model Using Systems Thinking to Develop Leadership of Agricultural Undergraduate Students

Thanat Samanakupt[1]
Department of Agriculture and Resource Management,
Faculty of Agricultural Technology,
King Mongkut's Institute of Technology Ladkrabang, Thailand
[1]thanat.sa@kmitl.ac.th

Noawanit Songkram[2]
Department of Educational Technology and Communication,
Faculty of Education,
Chulalongkorn University, Thailand

and Pichai Thongdeelert[3]
Department of Agricultural Extension and Communication,
Faculty of Agriculture,
Kasetsast University, Thailand

Abstract - **The purpose of this research was to develop an online collaboration model using systems thinking to develop the leadership of agricultural undergraduate students. The research method was divided into two phases: 1) the study of the effects of the online collaboration model and 2) the proposition of the online collaboration model. The samples were 46 undergraduates from the Faculty of Agriculture at Kasetsart University. The experiment was carried out for 12 weeks. The data were analyzed using frequency, percentage, mean, standard deviation and t-test. The research findings were as follows: the 6 components of the model include: 1) the learners having ability in self learning, 2) teaching and consulting of instructors, 3) the contents on agriculture situations, 4) online collaborative tools, 5) computer network, and 6) evaluation. The learning process includes: 1) preparation of the learners, 2) presentation of problems, 3) analysis of variables, 4) creation of casual loop diagram, 5) searching information, and 6) decision making and presentation. The samples who studied in the Agricultural course that was designed by the instructional and development model had post-test scores for the leadership skill that were significantly higher than their pre-test scores in the leadership skill at .05 significant level.**

Keywords - **Online Collaborative Tools, Systems Thinking, Leadership**

I. INTRODUCTION

Nowadays, innovation and internet technology play an important role in the daily lives of people around the world enhancing their quality of life, such as in communication, tourism, business, sport and especially education where technology is used in teaching. Knowledge is systematically collected into databases and these become large learning resources. People around the world can find answers to all questions quickly.

The Virtual Learning Environment (VLE) is a basic form of learning on the internet. Learners can learn content, find information, and interact between learners and others. The virtual learning environment is designed to have various tools on the system to access learning resources such as e-learning, appointment schedules, discussion board, e-mail, homework assignments, and quizzes, etc. It means that one of the successful factors of learners in self-study is managing their learning styles in collaborative work through various online tools on the internet, such as collaborative projects, problem-solving, etc. This is called an Online Collaboration Model. In addition, students can design a collaborative workspace with members within a group or other groups, including gathering or recording discussed data, sharing comments to review and guiding the group's decision. Good online collaboration tools must be installed and operated easily, having multi-functions. Everyone in the group can work together appropriately and effectively.

Teaching strategies have to define activities for group work, such as coordinating with others, having good human relations with colleagues in the organization and having leadership. (Bachelor of Science Program in Agricultural Science, 2011). Learners have to demonstrate responsibility for themselves and others for teamwork and can assist and support individuals in the group. The role of the leader (Sermsak Visalalaporn, 1997, cited in Suthep Pongsriwat, 2007) is a person who has one of these characteristics; 1) having a role or being influential to people in the organization, 2) having a role over others, 3) playing an important role in achieving the goals of the organization, 4) being chosen by others, and 5) being the leader of the group. Leaders must do three things; 1) behave as a team member and a suitable team leader, 2) cooperate with other agencies, and 3) express sincerity to the supervisors and subordinates by supporting the teamwork plan and encouraging full participation in decision-making. In order to rule the subordinates for solving problems systematically, linking the cause of the problem relationship (Peter M. Senge, 1990), leading to leadership and leading the organization to its goal, the good leaders must make a relationship with the person who is involved in the influence and power (Sermsak Visalaporn, 1997, cited in Suthep Pongsriwat, 2007). This is for making trust, including the ability to persuade others to believe in the leader. Leadership is a mystery that cannot be touched or seen. However, Daft (1999, cited in Suthep Pongsriwat, 2007) stated that "in contrast to most people's beliefs, leaders are not born, the leaders are made and they are made by effort and hard work". Therefore, developing learners to be leaders will be the beginning of training them to be able to face situations and problems, leading the group to the goal. They should also have the ability to make decisions, determine problems, plan, and take responsibility. This will produce graduates with quality and standard leaders to develop the society more effectively and sustainably.

II. LITERATURE REVIEW

A. Online Collaboration

An online collaboration is a method and process of collaboration among members within a group and between groups with the same objective or goal by using various tools to enhance communication to reduce the barriers of the time and place of collaboration. This makes team members manage to work together. It is more convenient for things such as controlling, managing, and accessing systems data. Team members can view, edit, or delete posts or subscripts, and save them. As a result, it increases efficiency, saves time, and helps decision making. For example, see Fig. 1.

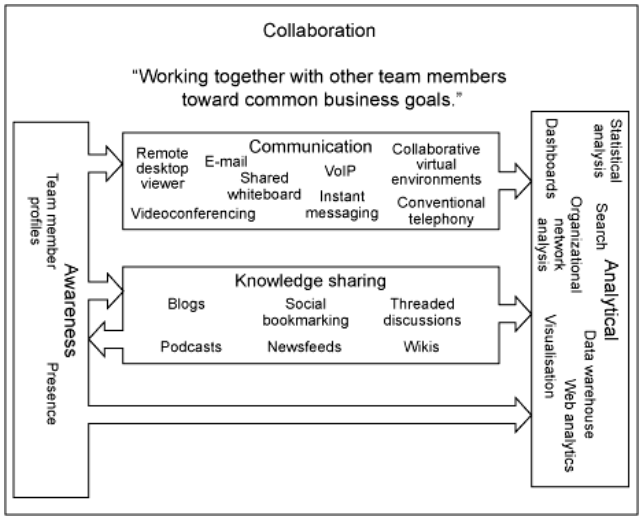

Fig. 1 Role of Tools in Collaboration Process (Broady, 2009)

The tendency of these technologies will affect the adoption of informal business collaboration tools. The users can access unofficial tools and are part of this process automatically. The trend toward using a personal computer in a user's personal life (using public services like Facebook, delicious, Blogger, and Wikipedia) will change attitudes about technology that is similar to that used in business (Bulkeley, 2007).

These types of online collaborative tools are what allows users to make choices to collaborate with others in different situations. They can be categorized and used for research purposes as follows:

1. **Types of Online Collaborative Tools:**

- ***Text and Message:*** This is for electronic letters / texts in which the content is in large quantities and can be sent to multiple recipients at the same time. This includes various types of attachments and real-time interactive conversations for immediate information exchanging.

- ***Social Media:*** This is an interactive, participative, and communal gathering.

- ***Mind Mapping:*** This is for problem solving by giving the opportunity to learn new creative methods.

- ***Search Engine:*** This is about searching text, image, audio and video, and other sources on the internet.

- ***Presentation:*** This is about using text, images or symbols to convey knowledge, understanding, opinions or stories using the principles and techniques of the presentation design through the software package.

2. **Online Collaborative Tools Include:**

- Registration and accessing system, personal information security system.

- Convenient operation menu, Thai-English compatible.

- Using messages to communicate (coordinating time - not coordinating time).

- Using a calendar to plan events, appointment scheduling, and notifications.

- Membership searching and collaboration system.

- Query, accessing demand data anywhere, anytime, both local and international areas on the internet.

- Posting and sharing information, interacting through social media.

- Shaping in mind mapping.

- Help the system of the tool.

Systems thinking is a holistic approach to understand the pattern of systemic situations. Systems thinking also provides a framework for defining the problem, questioning wisely, and effective decision-making because systems thinking operates under the power of tools (Sweeney, 1996). Systems thinking is a basic framework, knowledge, and tool developed over time to make each objective, solution, or creative work clear. In addition, it helps us see changes more effectively. Systems thinking does not neglect complexity but it deals with the complexity closely and reflects the cause of the problem effectively.

B. Systems Thinking and Organizational Development.

Effective organizations have to adopt systems thinking to operate their systems. Organization consists of various components which are indistinguishable but are all combined into one. For systems thinking, learners can view the situations that arise from the organization, not just one party. Every problem is so interrelated and cannot be separated.

The abilities of the learners to plan and indicate a problem-solving relationship are as follows;

TABLE I
SYSTEMS THINKING PROCESSES AFFECTING LEADERSHIP DEVELOPMENT

Process	Method	Factors affecting leadership
1. Determine problems / situations.	Focus on events that give learners the opportunity to express their thoughts to plan and set goals or accomplishments.	Planning: 1) be relevant to the future, 2) involve the action, 3) indicate that it is personal or organizational. 1. Identify the goal and future changes of the group (vision). 2. Define principles for their own practices and group members (mission). 3. Define the objectives of the performance clearly. 4. Set goals to guide them to success in the group. 5. Manage the group as they set the policies.
2. Analyze key variables and identify causes and effects.	Rely on prior knowledge to distinguish the elements of the problem, view the causes, and study the various associated factors.	Background and experience - are the mass of knowledge and skills, abilities and experiences in the past. These allow leaders to predict events most accurately. Synthetic thinking is the ability to combine elements together to get something new as they wish for or adapt something for the prior objective. Applied thinking is the ability to combine what has existed to the new context by essentially replacing the main features, adjusting the original issue to the situation and finding substitutes.
3. Create a ***causal loop diagram.***	Learners draw a ***causal loop diagram*** for the problem which has occurred.	Abilities to reason, gather relevant information and use reasoning to compare, interpret, link data, and explain how to solve the problems.
4. Find out more information, modify the model of problems or situations.	Learners search for more information from online resources, share knowledge and information with others through internet search engines.	Abilities to communicate both formal and informal communication to understand the organization's policies, listen to opinions and follow the group's practices, transfer knowledge, give advices, present tasks to the group effectively, and use interpersonal communication to talk or persuade members within a group and others as well.

Process	Method	Factors affecting leadership
5. Present the task to the group, brainstorm to improve the model.	Learners present the model and adjust it.	Abilities to diagnose. Decision processes are included; • Defining the scope of the problem and its relevance. • Analyzing the problem to find the cause. Splitting the issue correctly for precise decision on the issue. • Identifying the cause of the problem. Analyze and summarize the causes before leading to solutions. • Find the best solution to solve the problem using critical thinking and knowledge, skills combined with experience for choosing the best solution. • Follow that choice as a guideline for the implementation of the least resources and the most valuable effect.
6. Present to large groups with the instructor to summarize the model that can be used.	Learners present the model to the class.	

C. Leadership

Appropriate leadership for the learning outcomes of agricultural undergraduate students must demonstrate the abilities of the learners both in the role of a leader to accomplish his or her goals called "task-oriented leadership" or in the role of a member who has a good relationship with others called "relationship-oriented leadership". Bartol & others (1998) proposed a study of the leadership of Ohio State University that leaders who had high self-esteem and thinking of others were more likely to succeed and gain acceptance from followers than one-dimensional leaders. According to Blake & Mouton (1985), good leadership must be a team effort. This means that a leader who focuses on both tasks and people is the most effective leader. The leadership of agricultural undergraduate students can be divided into 10 characteristics of task-oriented and 10 characteristics of relationship-oriented leadership as follows:

10 characteristics of task-oriented and 10 characteristics of relationship-oriented leadership.

TABLE II
THE RESULTS OF THE SYNTHESIS THE LEADERSHIP THEORIES OF AGRICULTURAL UNDERGRADUATE STUDENTS

Leadership Characteristics of Agricultural Undergraduate Students	
Task-Oriented	**Relationship-Oriented**
1. Plan to set a clear goal.	1. Let others share the goal and be confident in the work.
2. Define the roles and responsibilities of co-workers.	2. Define principles for their own and group members' practices.
3. Find the reason and identify the cause of the problem by themselves.	3. Pay attention to feedback, suggestions, and obstacles.
4. Complete the task on time.	4. Do not guide the decision of the co-workers.
5. Use prior knowledge to adapt for the highest value.	5. Give an opportunity for co-workers to make decisions.
6. Ask and set procedures clearly.	6. Rely on importance and friendliness.
7. Always check the work.	7. Have interpersonal communication skills.
8. Find the best solution to solve the problem.	8. Help and support to colleagues.
9. Decide everything themselves.	9. Let others take part in making decisions.
10. Use instructions or tell others to do as they planned.	10. Provide guidance or coach over ordering.

III. METHOD AND DATA COLLECTION PROCEDURES OBJECTIVE

1. To compare the leadership of agricultural undergraduate students before and after learning with an online collaboration model using systems thinking to develop their leadership.

2. To propose the online collaboration model using systems thinking to develop the leadership of agricultural undergraduate students.

A. Scope of Study

- **Population and Samples**

The research population in this research is instructors, agricultural undergraduate students, experts and educators. The samples used in the research were as follows:

1. The samples used to study the opinions towards the model were 15 samples consisting of 6 computer-based instructional specialists, 3 agricultural specialists, and 3 experts in systems thinking.

2. The samples used to study the online collaboration model using systems thinking to develop their leadership were 46 third and fourth year undergraduate students from the Faculty of Agriculture at Kasetsart University.

IV. RESULTS

A. Experimental Results of the Online Collaboration Model Using Systems Thinking to Develop the Leadership of Agricultural Undergraduate Students.

Research in this section aimed to: 1) compare the leadership of learners before and after learning with the online collaboration model using systems thinking to develop the leadership incorporating situations to develop task-oriented and relationship-oriented leadership and 2) assess behaviors of agricultural undergraduate students towards the online collaboration using systems thinking to develop their leadership.

1. The comparison of pre-test and post-test scores on the leadership of 46 samples found that students who followed the instructional plan for the online collaboration model using systems thinking had leadership scores after learning that were higher than before learning as a whole at the .05 level. When considering each aspect, it was found that task-oriented and relationship-oriented leadership after learning was higher than before learning statistically significant at the .05 level.

TABLE III
COMPARISON OF TASK-ORIENTED AND RELATIONSHIP-ORIENTED LEADERSHIP SCORES BEFORE AND AFTER LEARNING OF THE SAMPLES

Scores	n	$\bar{X}$	S.D.	t	Sig.
Before	46	154.54	20.73	12.86	0.0000
After	46	161.15	20.40		

*statistically significant at the .05 level

From Table III, average score before and after learning of the samples who followed the online collaborative activity plan was 154.54 and 161.15 respectively. When comparing the pre-test and post-test scores, it was found that the post-test scores were higher than the pre-test scores at the .05 significance level.

2. From leadership scores, it was found that 11 students who had high scores on task-oriented and relationship-oriented leadership were assigned to lead the group in assigned tasks and could assign roles in group working effectively whereas the 35 students who had very low – moderate scores would work as a member of the group to share knowledge, search information and guide the members as well. This lead group succeeded in planned work.

TABLE IV
COMPARISON OF TASK-ORIENTED AND RELATIONSHIP-ORIENTED LEADERSHIP SCORES BEFORE AND AFTER LEARNING OF THE SAMPLES WHO WERE ASSIGNED TO BE THE GROUP LEADER

Scores	n	$\bar{X}$	S.D.	t	Sig.
Before	11	180.00	11.14	6.47	0.0000
After	11	186.36	9.33		

*statistically significant at the .05 level

From Table IV, average scores on task-oriented and relationship-oriented leadership before and after learning of the samples who studied with the online collaborative activity plan and assigned to be the group leader were 180.00 and 186.36 respectively. When comparing the pre-test and post-test scores, it was found that the post-test scores were significantly higher than before the experiment statistically significant at the .05 level.

TABLE V
COMPARISON BETWEEN TASK-ORIENTED AND RELATIONSHIP-ORIENTED LEADERSHIP SCORES BEFORE AND AFTER LEARNING OF THE SAMPLES WHO WERE GROUP MEMBERS

Scores	n	$\bar{X}$	S.D.	t	Sig.
Before	35	146.54	16.02	6.69	0.0000
After	35	153.23	15.97		

*statistically significant at the .05 level

From Table V, average scores before and after learning with the online collaborative activity plan of the samples who had very low - medium scores on task-oriented and relationship-oriented leadership were 146.54 and 153.23 respectively. In comparison to the pre-test and post-test leadership scores, it was found that the post-test scores were higher than the pre-test scores statistically significant at the .05 level.

B. Results of the Online Collaboration Model Using Systems Thinking to Develop the Leadership of Agricultural Undergraduate Students.

1. The online collaboration model using system thinking to develop the leadership of agricultural undergraduate students consisted of:

1) Purpose of the Model

To develop the leadership of agricultural undergraduate students with the online collaboration model using systems thinking.

2) Principles and Basic Concepts of the Model

- Online Collaboration
- Systems thinking
- Team Building
- Leadership

3) Model Elements

- Agricultural undergraduate students must have the following characteristics: 1) ability to search for information, 2) analysis, research, decision, reasoning, 3) ability to communicate with others in small group activities, 4) ability to work in different groups, demonstrating responsibility to both themselves and others, and 5) managing time according to plan and schedule.

- Instructors in agricultural education who serve as an instructor and consultant have to be specialists who can educate the learner effectively.

- There are contents of the agricultural course with examples of problem situations.

- Online Collaboration is classified into 5 categories as follows:

(1) Text / chat, email / real-time interactive conversations for exchanging information immediately.

(2) Social media, digital media that is a tool for social performance, communicating with each other in social networks through websites and any media applications on the internet.

(3) Mind mapping, planning, decision making, remembering, problem solving, presentation, problem solving by giving them

the opportunity to see new creative methods.

(4) Searching, accessing to demand contents at anytime and anywhere including feedback's users, participative and communal gathering, search engine, query, and especially information on the Internet.

(5) Presentation, the use of text, images or symbols to represent the process, the descriptions or messages to convey knowledge, understanding, opinions or stories using the principles and techniques of the presentation design through the software package.

- Internet Networking.

- Evaluation of the model: 1) holistic evaluating using a leader behavior description questionnaire and 2) evaluation during the learning process using the observation of learning behavior based on the leadership characteristics.

- Processes of the online collaboration model:

(1) Prepare
(2) Present the problem situations
(3) Analyze key variables
(4) Create a causal loop diagram
(5) Search for more information
(6) Decide and present the work

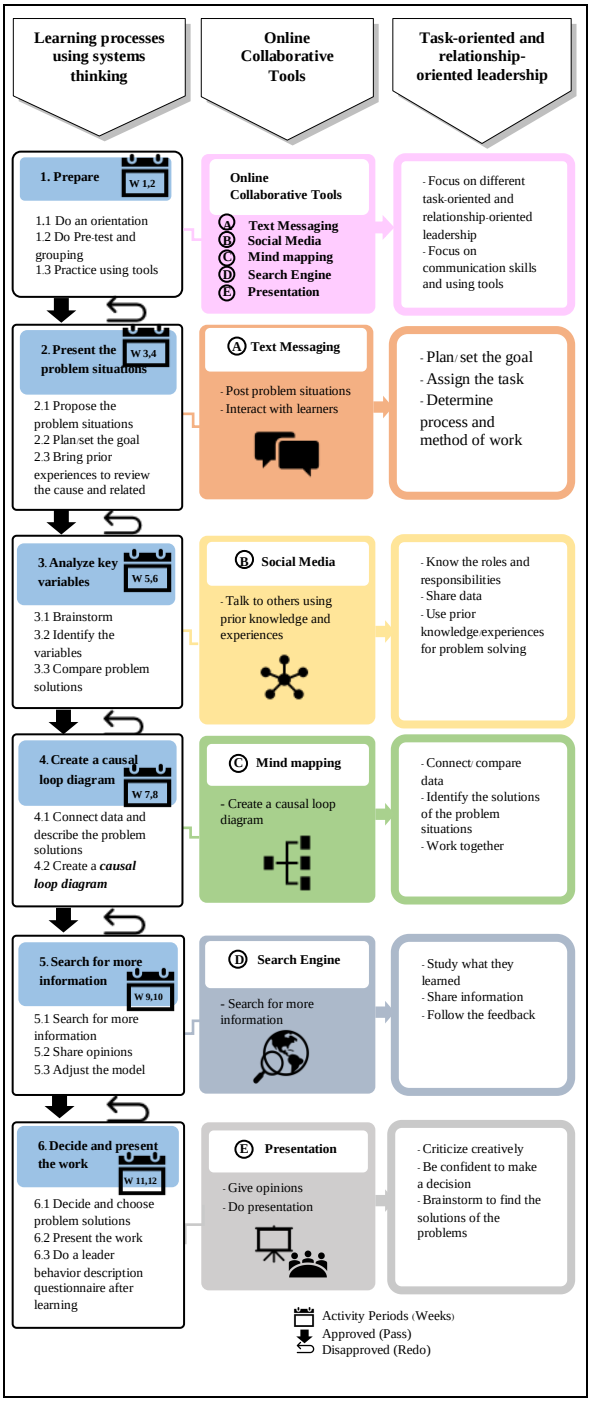

Fig. 2 The Learning Processes Using Systems Thinking via Online Collaborative Tools

2. The results of the evaluation of the appropriateness towards the online collaboration model using systems thinking to develop the leadership of agricultural undergraduate students by the experts: it was found that the IOC was at the acceptable 0.8 - 1.0 level. It revealed that the developed online collaboration model using systems thinking was appropriate and practical.

V. CONCLUSION

Developing the online collaboration model using systems thinking to develop the leadership of agricultural undergraduate students uses online collaborative tools in teaching. Learners can choose the online learning tools for management and collaboration on the internet with the purpose or goal of working, such as collaborative projects, and solving problem situations in and outside of class. This enhances learners' ability to work together with group members and the instructors independently in order to increase the effectiveness of work. Learners have to use online collaborative tools with systems thinking processes that focus on a step-by-step working, knowing the goal, using prior knowledge, searching for more information, interacting among learners, and making a decision in order to develop leadership. It is the beginning of training for all learners to adapt the situations and the problems to meet the goals of learning. In addition, it encourages learners to make a decision, determine problems, plan, and take responsibility. It will produce graduates with a quality and standard of leadership to develop society more effectively and sustainably.

VI. ACKNOWLEDGEMENTS

This dissertation was funded by The 90th Anniversary of Chulalongkorn University Fund (Ratchadaphiseksomphot Endowment Fund).

REFERENCES

(Arranged in the order of citation in the same fashion as the case of Footnotes.)

[1] Bachelor of Science Program. (2011). "Bachelor of Science Program, Faculty of Agriculture: Kasetsart University". Revised Curriculum, Academic Year 2011.

[2] Bartol, K., Martin, D., Tein, M., and Matthews, G. (1998). "Management a Pacific RIM Focus (2nd Ed.)". Sydney: McGraw-Hill.

[3] Blake, R. and Mouton, J. (1964). "The Managerial Grid: The Key to Leadership Excellence". Houston: Gulf Publishing Co.

[4] Broady, A.F. (2009). "Informal collaboration tools for global software development teams-Tools that can help bridge geographical and cultural gaps".

[5] Daft, R.L. (1999). "Leadership: Theory and practice". Forth Worth, TX: Dryden Press.

[6] Senge, P. (1993). "The Fifth Discipline: The Art & Practice of the Learning Organization". London: Century Business.

[7] Visalaporn, S. (1997). "Leadership: Theories and Practices in Educational Administration Unit 5 (3rd Ed.)". Nonthaburi: Sukhothai Thammathirat Open University, p. 42-104.

[8] Pongsriwat, S. (2007). "Leadership. Bangkok: Expernet".

[9] Sweeney, G. (1996). "Learning efficiency, technological change, and economic progress". International Journal of Technology Management, Vol. 11(1-2), p. 5-27.

[10] Bulkeley, W.M. (2007). "Playing Well with Others". Wall Street Journal.