Using Grounded Theory to Redefine the Role of Teacher and Student in the E-learning Environment

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ABSTRACT: The popularity of the E-learning environment is increasing. The focus of this study is on the roles of teacher and student and the interaction between them in the learning environment. Eight teachers and twenty-nine students with experience of using the E-learning system were interviewed. Based on the interview results and grounded theory, the study presented the role of teacher and student and constructed an interactive model. Utilizing a technological frame model, also examined were the discrepancies in the roles of teacher and student between the E-learning environment and the traditional learning environment.

The results of the study were: first, in contrast to the traditional learning environment, the roles of teacher are not only instructor, manager and mentor, but also learner and technologist. Second, students in the E-learning environment learn through two-way interaction, as an instructor, a manager, a mentor and a technologist. Although teacher and student each have five roles, their behavior is not the same. In terms of their roles as instructor, mentor and learner, their behavior is the same; however, their respective behavior as manager and technologist is not the same due to the differences between the position of teacher and that of student.

The contribution of this study is to help teachers and students who wish to play a part in the E-learning environment to become aware of the different expectations of each party. Moreover, the study assists both teachers and students in recognizing what they can do in the E-learning environment to minimize the risk of role conflict and role ambiguity.

KEYWORDS: E-learning, Role, Technological Frame, Grounded Theory.

1. Introduction

E-learning is defined by American Society for Training and Development (ASTD) as E-learning is a sub-set of distant education, which refers to learning methods that transmits content in electronic media in a broad sense. Transmission ways include network, satellite, video tape, sound recording strip, interactive television and disk. E-learning doesn’t impose limitations to teaching activities in geography and time, and doesn’t require tangible teaching place and cost resources in face-to-face teaching (Jarvis, Holford, and Griffin, 2003). Alaxander and Potter (2005) presented that through
technological development in network communication, teachers and students are able to conduct teaching activity in more flexible learning environment and study with digitalized data.

Network teaching doesn’t focus on personal interaction but also emphasizes the importance of interacting with network environment. The interaction process affects learning process and learning results (Garrison and Anderson, 2003). In interaction with others or environment, each individual plays a certain role and communicates with others by adopting a behavioral mode suitable to his role. In E-learning, roles of teachers and students are mutually influenced. Member who is clear at role definition knows how to communicate with others, works and studies in network environment, which greatly improves achievements of E-learning. For example, teacher defines his role or the role given by others, as teacher is a person imparting knowledge during teaching by means of network, who displays teaching material by network teaching tools and proposes interesting learning topics. If student believes he plays a role of absorbing knowledge in E-learning, he will pay hard efforts to study teaching material and collect material under E-learning environment. On the opposite, if roles are interpreted wrongly, when joining in learning activity, because of conflicts generated from expectation on self-role and that thought by others, or shortage of explicated information in how to play the role, role conflict and role ambiguity may be generated. For example, teachers define e-teacher as teaching material editor or technical operator, whereas students hope teacher to build up positive atmosphere in classroom. This conflict may cause uncoordinated interaction between teachers and students in classroom teaching activities. Or student takes his role and acts as a reader, believing that learner in E-learning should receive information passively, which leads to learners can’t communicate and interact well with others in classroom activities, finally, it causes unsound interaction between teachers and students and low learning frequency as well as low learning achievement.

Instructor and learner in E-learning will present their identity characteristics and behavior performance in E-learning platform through definitions and expectations on their roles and those thought by society. When interacting with others, people use labels of such society organizations to define themselves and the relationship between them and others. During E-learning, people communicate with others by taking science technology as media, however, when interacting by scientific technology, people need to redefine and review roles they play. According to study made by Smith and Kolosick (1996) in E-learning, they pointed out that in past tangible teaching, teachers played the role of imparting knowledge and management as expert. Lam and Lawrence (2002) found that under E-learning environment, teachers also played the role of expert, but obviously its role as management expert reduced. It is not only teacher’s role varies with E-learning method, interaction mode and curriculum teaching material management but student’s
role varies too. Piccoli and Ahmad (2001) pointed out that in the past, students usually received knowledge in passive way in class, who played the role of receiver, however, under E-learning environment, Lam and Lawrence (2002) believed that students could master their learning process and generate more autonomous behaviors, played extra roles as manager or expert.

Relevant studies by Orlikowski and Gash (1994) were based on frame theory, which studied behavior changes on users caused by scientific technology. By referring to frames, many scholars studied the influence of information technology on behavior modes of organizational members (Elliott et al., 2002; Davidson, 2002; Fong and Woodruff, 2003). Frame theory implies that knowledge, experience and undergoing occupied by individuals in the past makes people constantly encounter meanings endowed in various matters (Fong and Woodruff, 2003). Frame could provide individuals the experience in construction in systematic way, so as to reduce uncertainty, provide basic criteria and enhance their understandings to facts when people confront complex and unfamiliar environment (Gioia, 1986). Orlikowski and Gash proposed technological frame in 1994, believing that technological frame will affect interpretation on technology among organizational members, endow meanings to such members before they interacted with technology, and generate specific knowledge expectation, and finally generate changes in behavior. For example, teachers who are accustomed to tangible learning believe that network technology restricts interaction in class and teaching material delivery. But, teachers who are integrated into E-learning say E-learning is a best teaching tool. For students who are not competent in technology application and have insufficient time, E-learning provides them a more flexible learning way.

Role and frame theory help researchers understand roles of teachers and students in E-learning. Through learning experience in the past and sharing mutual frames, students gradually adjust their cognition and interpretation on different roles and environment after moving to E-learning environment. Therefore, this study aims at finding roles of teachers and students by means of frame content generated, changed or originally held by teachers and students in E-learning environment. Additionally, it observes interaction ways of teachers and students in classroom platform and understands interaction ways among different roles.

2. Literature review

2.1 Network teaching

Digital technology learning is earliest derived from learning military training film in America, which taught all staff overseas to receive training. After world war ends, film
teaching came out, and extended to TV teaching. In this way, teaching in any form can be brought into classrooms. Video tapes can be used into teaching for long term. Cables are used to transmit teaching content into remote regions. In 1970s and 1980s, people devoted themselves into computer-based training (CBT), however, encountered several obstacles in execution: first, rapid changes in technology made computers incompatible with other manufacturers. In the case that standard was inconsistent, it is impossible to make software conform to all application platforms. Second, at that time, teaching manifestation and manufacture process were not sufficiently matured. Third, increase in stability of teaching content, spending time and cost intensified people’s suspicion on the effectiveness of investing financial power into building a set of system (Rosenberg, 2001). After internet flourishes in 1990s, E-learning broke through limitations on learning time and space. This allowed people to acquire newest information in world by means of network. As to content and creation of network teaching material, because of standard specification stipulated, teaching material and content specification provided by various manufacturers were not in a mass anymore. For example, Sharable Content Object Reference Model (SCORM) was created by Advanced Distribution Learning Initiative (ADL) by integrating various learning standards. There is a uniform set of specification in creation of digital teaching material and content development (Su et al., 2006).

Network changes teaching dramatically and provides a brand-new exemplar and thinking mode. E-learning provides self-orientation learning for learners, which doesn’t change teaching process but also changes roles of teachers and students playing in teaching. Allan (2002) and Garrison and Anderson (2003) pointed out that E-learning provided a more flexible learning way to students, who could acquire learning resources more easily and more abundant teaching content, as well as a communication environment that multiple people joined in with low cost. Rosenberg (2001) believed that E-learning had the ability of revising and spreading information immediately. However, E-learning needed teachers and students have basic ability in handling with information technology. Training is necessary for teachers and students. However, those factors mentioned above may lead to users are afraid of it, because they are new entrants for touching E-learning. Lynch (2002) believed that teachers could understand whether students are obscure at teaching content or rush to make a speech by observing looks of students and walking around under the platform, or know about the understanding degree of them toward curriculum contents by eye sights and acts. However, E-learning lacks of visual clues and opportunity of providing actual interaction and observation. Murphy et al. (2004) believed though E-learning had some shortages, E-learning provided customized and self-oriented learning as well as other advantages, which pushed many college students to conduct digital and computer-based teaching, and encouraged teachers and students to take E-learning as a teaching strategy of substituting or replacing face-to-face teaching.
To design and develop teaching material and suitable learning environment, teachers must work more closely with teaching material designer and professional technicians. All staff in E-learning is constantly facing changes in their roles and responsibilities.

2.2 Role

Mead (1934) interlinked individual characteristics and personality with social behavior, believing that roles were products of socialized individuals. Linton (1936) insisted on a belief that role was status and status was dynamic role, including rights and obligations. Combining thoughts of Mead and Linton, Parsons (1951) proposed that teacher role was to interact with others, who was an actor oriented by organization and knows how to construct and explicitly know in which form to interact with others during interaction. Levinson (1959) and Kahn et al. (1964) believed role had three meanings at least: (1) Role is relevant with social specification and expectation parameters. (2) Concepts and thoughts of roles which are held by individuals. (3) Roles are what behaviors act. In other words, role is composed of social specification, individual thought and behavior mode, including a group of individual behaviors and expectation given by interacting actors. Moreover, Zigurs and Kozar (1994) pointed out that due to expectation from different environments and those given by others, individuals tend to change roles they are playing. By summarizing words of above scholars, role is status containing a group of expectation and behavior parameters given by others. When people are playing a certain role, they will show behaviors they duly have, so as to meet expectations from the public and themselves.

Wright (1987) believed that in many social circumstances, defining characteristics and features of one role is mainly made from the view of occupation, however, there are other concepts helping to define roles. They are: (1) Completed jobs and activity related to work. (2) Relation between individuals and others. (3) Communication, belief and attitude. For example, except teaching, teachers should also answer questions of students, give topic discussion and control interactive atmosphere. At this time, teacher will communicate and interact with students as well as play the role of teachers. However, when staying out of classroom, the teacher must coordinate with other teachers in aspect of curriculum and communicate with technicians to provide most suitable contents in teaching.

Roles of teachers playing in tangible classroom include: (1) teacher: who uses provided teaching material to present theory and knowledge to students for learning and try to attract attention of students (Harvard and Dunne, 1992; Samantha, 2004). Badley and Habeshaw (1991) believed that teacher played the role of strict instructor or speech maker, controlled the whole learning environment, and occupied supreme rights in the process of teaching, seldom challenged by students. Lam and Lawrence (2002) indicated
that teachers were regarded as individuals occupying vast knowledge quantity, who
decided knowledge content learnt by students in classroom. (2) Manager: teacher plays the
role of manager in classroom, who has the right of deciding students how to learn (Lam
and Lawrence, 2002). Samantha (2004) and Harvard and Dunne (1992) indicated that
teachers devoted themselves into managing learning performance of students, provided
and managed teaching material content and maintain order. (3) Mentor: teacher give
supportive response to students in teaching process and encouraged students to learn
(Harvard and Dunne, 1992). Gibson and Mitchell (1995) believed that in the process of
learning, teachers must play the role of mentor, and assist students in learning by means of
same methods and giving concerns.

As to E-learning, scientific technology allowed people to interact with each other
keeping far away from limitations on space and time (Berge, 1995). When conducting
teaching activities, it must depend on scientific technology as information transmission
media, allowing teachers and students to enjoy benefits brought by technology (Lynch,
2002). Thus, three traditional roles for teachers have been greatly expanded. For example,
(1) pedagogical: who doesn’t have professional knowledge, but also has strong desire to
assist students in learning and the abilities in storing information, memorizing, thinking,
problem solution, pedagogical concept, technical discussion and response in teaching
(Berge, 1995; Coppola, Hiltz and Rotter, 2002). Liu et al. (2005) believed the role of
teachers in aspect of teaching covered curriculum designer, professional illuminator,
feedback giver and interaction facilitator. (2) Mentor: teacher established social relation,
undertook actions affecting the relationship with other teachers and students, and
established amicable learning atmosphere (Berge, 1995; Liu et al., 2005). Coppola et al.
(2002) believed that in the process of teacher interacting with others; it involved vigor
presentation, human sense and non-language physical communication. (3) Managerial
Role: teacher in E-learning played the role of director, ensured relevant characteristics
under teaching environment to develop normally performance and successfully executed
it from beginning to ending (Lynch, 2002). According to study and observation made by
Xiao et al. (2005), they pointed out that teacher must know how to design curriculum
and ensure students to occupy required resources and learning media during executing
activities. Coppola et al. (2002) believed that managerial roles of teachers included:
stipulate class opening plan, communication and coordination with administrative
departments and others in aspect of curriculum, guide students to learn and evaluate
learning achievements of students. However, Liu et al. (2005) believed managerial is
meeting manager and organization planer, seen in the target and schedule of on-line
meeting discussion and stipulation of principles and specification in E-learning mentioned
by Berge (1995). (4) Technical Role: teacher must undertake technique supporter and
multi-media design role, who allows students to use system and software more ease
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(Berge, 1995; Liu et al., 2005). However, Xiao et al. (2005) indicated that though teacher was not familiar with use of various technological tools or lacked of some specific technology skills, he was still able to assist students in learning and contributes to the whole learning process.

Regarding students, in tangible teaching, Lam and Lawrence (2002) believed that students were passive knowledge receiver in the past, to rely on thoughts of teachers, memorize and recite knowledge without much thinking in learning, particularly in subject recited or curriculum taught in big class. In such types of classes, students have a low degree of participation in class discussion, because they have no control rights and are dependent learners. Additionally, partial students are assigned with tasks as pupil teacher, whose work is to assist in teaching, e.g., mark corrections on student’s paper, review homework, undertake communication and coordination. However, a majority of students play the role of learner.

Empirical study finds that in E-learning environment, Piccoli and Ahmad (2001), Lam and Lawrence (2002), Xiao et al. (2005) and Hurd (2006) believed that roles of students playing include: (1) Expert/Teacher: student can share knowledge to the classmates. E-learning doesn’t allow students to share knowledge with team members but also shares their experience and knowledge with all members in the whole E-learning (Lam and Lawrence, 2002; Xiao et al., 2005). (2) Manager: student could effectively manage their learning schedule and master learning process, generate autonomous behavior (Piccoli and Ahmad, 2001; Lam and Lawrence, 2002; Xiao et al., 2005). (3) Learner: learner still maintains the role of receive, who is no more passive role. Except actively seeking assistance of teachers, he also actively builds knowledge, solves complex problems, and undertakes a member in cooperation learning group by reviewing discussion topics from multiple views (Lam and Lawrence, 2002).

E-learning changes interaction mode in teaching and adds interaction between people and environment except interpersonal interaction. In the process of interaction, teachers and students adopt behavior modes suitable to their roles to interact with each other in teaching. Their roles are mutually affected in the process of teaching and further change each other. Interaction process in teaching affects teaching fruits. Role definition of members affects interaction process. Thus, clear role definition will be helpful for communication and interaction with others and environment and enhance teaching performance of network.

2.3 Sci-tech frame

Frame referred to hypothesis, knowledge, expectation and behavior of people acting toward various social phenomenon (Orlikowski and Gash, 1994). Davidson
Chia-Ping Yu, Chia-Yu Chang (2002) believed frame was a knowledge structure, coming from relevant knowledge or experience of individuals. Fong and Woodruff (2003) believed that frame content occupied by individuals never changed with different environment. Frame helped people understand surroundings and described events through simplified frames (Elliott et al., 2002). In the process of interacting with others, frame helped people utilize the experience in the past to solve problems, understand obscure information and filter new information (Davidson, 2002). Individual reference frame is an invisible knowledge pool. Frame structure and content are flexible. In different time environment, structure and content could vary differently (Orlikowski and Gash, 1994; Davidson, 2002). Reference frame among organization members is an invisible criterion, which is used to construct and form interpretation of members to various phenomenon in organization. Though members have individual interpretation frame, they still occupy a set of core beliefs, which is called sharing of frames. In the process of specialization, in-service training and socialization, it is regarded as a kind of sharing frames that group members try to give specific cognition structure to other people. Therefore, when some people claimed to have shared frame, it indicated they had some resembling core cognition components (Orlikowski and Gash, 1994). For example, it requires E-learning teachers to have basic skills in operating computer by means of re-training.

Positive influence of frame includes, providing structural and organizational experience, enhancing understanding of individuals to obscure circumstances, reducing uncertain and complex situations and providing basic behavior criterions. When frame had fixed original hypothesis and knowledge but didn’t reflect truthfully facts, or distorted facts for conforming information to existing cognition frame, and restricted creativity power in solving problems, at this time, frame could turn to be bounded (Orlikowski and Gash, 1994). It was just told by Bolman and Deal (1991) that frame could create psychic prison and restrict ability of further learning of people. Walsh (1995) also indicated that after frame was formed, it could be resistant once encountering changes. People didn’t look at old matters from new views, didn’t adopt different or more effective methods to handle with old matters, and thus couldn’t conduct reframe (Orlikowski and Gash, 1994). For example, teachers in tangible teaching believe that they should focus on teaching and students will listen to them naturally under teaching platform. However, under E-learning environment, if teaches regardless of students’ feelings, the teaching process looks like delivering on-line teaching programs in single party, students will feel boring. E-learning teachers must readjust frame content in the past. Similarly, because students and teachers interact into teaching in remote place under E-learning environment, it is different from face-to-face teaching in classroom. If students use the past learning views into interactive modes under E-learning, they may easily believe E-learning interaction is boring and insufficient.
Orlikowski and Gash proposed technological frame in 1994, which highlighted specific explanation on technology and the role of technology playing in organization. In the process of people interacting with technology, specific hypothesis, expectation and knowledge about technology are developed, so as to form action criterion in future. Technological frame is an abstract concept, a tool used to analyze demands of different users toward technology in organization. Sovacool (2006) and Davidson (2002) believed that technological frame attempted to observe interactive relation among organization members, understand different demands and beliefs they are supportive of, and combine all factors affecting group interaction, and finally endow specific meaning of technical artifact. In the process of frame forming, technological frame plays the following roles: (1) Filter for social cognition, including value concept of organization members, method, target, intangible knowledge and user participation. It involves the view that information system development makes members highlight information technology. (2) Technological frame is based on frame concepts, assists organization members in filtering information that is inconsistent to existing frame. (3) Technological frame triggers trigger, which allows organization members to generate new understandings on information demands. Finally, technological frame changes design methods and use methods of technology inside organization. For example, Blosch and Preech (2000) believed that formation of technology was made by thoughts, events concerned and interaction among designer, information staff, engineer and other relevant actors. Brown and Duguid (1991) believed that technological frame reflected organization members share understandings toward technology meanings. Organization members have different explanations toward technology orientation in organizations based on their interaction with technology.

Orlikowski and Gash (1994) highlighted the relation between frame contents and execution and use of technology. Three concluded fields are: (1) Nature of technology: understand the ability brought by technology. (2) Technology strategy: the working mode dramatically changed in order to achieve enterprise strategy and understanding degree of changes in current status of organization. (3) Technology in use: understanding of status after technology is operated and used in reality. Regarding nature of technology, factors affecting technological frame of teachers in E-learning include: synchronous and asynchronous actions in E-learning, E-learning has no restriction in time and space, system records completely learning process of students, teachers understand the status of students making speech according to statistical information provided by the system. Regarding technology strategy, factors include: E-learning provide more time to teachers and students in discussion and E-learning is new tendency in future. Factors for technology for use include: teachers need administrative support, e.g., assist relevant administrative organization in establishing student inventory, set out evaluation mechanism, record teaching material, help teacher edit and record teaching material, understand the status
of students making speech, or record learning process of students by using examination system. All such factors involve technical assistance or troubleshooting. Therefore, teachers in E-learning must work close with other staff, in order to realize teaching strategy successfully by means of technology.

In conclusion about above literature contents, E-learning has no limitation in space and time, further affects attitude and expectation of different groups using E-learning on technology, and change the roles of teachers and students in the process of teaching. This study is based on role and frame theory, verifies hypothesis and expectation of different groups on E-learning and further discovers roles of teachers and students playing in E-learning by utilizing grounded theory.

3. Research methodology

3.1 Research sample

Established in 1986, National Open University is the first university applying video and audio media into teaching throughout the country. Its teaching methods include face-to-face teaching and delivering teaching content by television, broadcast, internet, remote video as well as other channels. Since 2003, National Open University has tried to open E-learning teaching curriculum for research institute and adopted mixed teaching way. Except synchronous teaching activity held weekly on E-learning platform, face-to-face teaching will be also conducted six times in each semester and synchronous teaching activity in non-fixed time are included. In holistic view, National Open University has rich information available to researchers for deeper study in aspects of teaching history and teaching ways. Thus, this study adopts this university as study sample.

As to asynchronous teaching, National Open University adopts Wisdom Master Platform (http://dl.nou.edu.tw). This platform provides guides to teachers on relevant working procedures and allows teachers to know how to upload teaching plan. Teachers can manage student, curriculum, homework, test, score, online questionnaire/voting. Take curriculum management as example, teachers can set out the number of students having class, upload teaching material and set out issues. After students load their account numbers, they can select network curriculum they join in, and join in team topic discussion with students in such curriculum, interact with others in message board, hand in assignment and watch teaching material. Regarding synchronous teaching interaction, National Open University adopts Joinnet software. Teachers can control the right of students making speech and permit whether they are allowed to enter curriculum. During curriculum is undertaken, teachers place files to be uploaded on white board, let students watch it, designate students to make speck and conduct online real-time voting. During
interaction by means of synchronous video, students can watch teachers and other students by network video camera equipped by themselves, and use microphone to talk with others. Therefore, the interaction mechanism between teachers and students is not limited on teaching of teachers singly or reading teaching material by students singly, but it is realized by multi-party communication in this system platform or participation in synchronous/asynchronous curriculum discussion.

Trial curriculum opened by research institute in 2005 included business management research institute and public administration research institute, totally 11 full-time teachers and 16 part-time teachers hired and 38 students enrolled for business management research institute and 28 students for public administration research institute. This study selects 8 E-learning teachers (all are male) serving different departments. It contains people having experience from 1 year at least to three years at most in E-learning teaching. Regarding teaching breadth, except full-time and part-time teachers, interview is also made to stationary teachers giving regular online guidance to students. As to students, totally 29 students from E-learning are interviewed, the ratio of boys to girls approximately 7:3, aging from 30 to 60 years old, who come from the north, the middle and the south. Majors selected include business management research institute and public administration research institute. Therefore, regarding the skill in operating computer, except students who are best at technology operation, learners who don’t come from information research institute are also included. The ratio of having learning experience on network and not having learning experience on network is 1:2 respectively. All interviewers work more than 5 years, and interact with teachers in E-learning class.

This study adopts semi-structure and structural semi-structure questionnaire into interviews. Except directly interviewing teachers face to face, indirect interview is also conducted to supplement data. All interviews are made to teachers from August, 2006 to September, 2006. 8 interviews are complete. Conversation records last about 8 hours. Direct interview is made to interviewed students face to face or non face-to-face interview for several students (e.g., by means of MSN, SKYPE). All interviews are made to students from September, 2006 to January, 2007. 29 interviews are complete. Conversation records last about 17 hours. Teacher questionnaire covers teaching, management, socialization and technique roles undertaking E-learning. Student questionnaire is dominated by the role of students expecting teachers to play in E-learning, which includes personal characteristics, teaching role, social role and technical role.

3.2 Mode construction

The main reasons why this study adopts grounded theory are: (1) grounded theory allows researcher to develop and describe theory by targeting research topics, helps researcher to effectively capture dynamic relation between meaning and process from
complex organization situation. (2) Because E-learning has been executed for many years, the roles of teachers and students playing in process of learning could be generated clearly and usefully classified on the basis of grounded theory. (3) Data analysis way in grounded theory helps researcher observe roles of students and teachers playing in E-learning, and interactive and learning process carried by both parties. Therefore, this study is based on grounded theory, utilizes open coding, axial coding, selection mode to analyze data of behavior mode for teachers and students in E-learning environment. Firstly, conduct concept analysis on data by using open coding, and conduct relevance analysis on axial coding by using data results acquired from concept analysis, finally selectively review relevance data by refereeing to study topics in this study and validate data results.

Open coding refers to a pyramid structure composed of category, concept and indicator, classified into category→concept→indicator from top to bottom. After resembling indictors are summarized, they form concepts through concept procedures. Resembling concepts classification will form category through abstraction, seen in Figure 1.

![Figure 1](image)

**Figure 1  Open Coding: Relation among Category, Concept, and Indicator**

This study constantly compares similarity and difference of data through data analysis carried by 4 researchers for half a year, proposes questions toward phenomenon reflected from data, and discusses it with other researchers in the study. From the beginning, in the process of searching interviewed data to a large extent, it gradually shortens scopes and seeks for conceptual description that optically covers the whole discussion topics. Through considering and comparing these indicative sentences and phases, concepts are summarized. After data is conceptualized, concepts are clustered and classified into category. There are 9 categories, including: (1) Network teaching activity: it refers to teaching and learning activity undertaken by teachers and students in E-learning and learning atmosphere established and how to apply technology into teaching. For example, class activity, enhance participation of students and conduct interaction by using E-learning environment. (2) Manager: when undertaking online teaching, teacher assigns homework to students and provides learning material or plans teaching activity. For
example, solve disputes, time management, design teaching activity and create teaching material for network. (3) Instructor: it is information provider in E-learning. Member who provides knowledge is instructor. For example, solve problems faced by students in classroom, make speech on class and guide learning. (4) Technician: it is member who gives technical support and solves troubles in E-learning. For example, under technical support for other teachers, student is leader in aspect of technology. (5) Learner: in E-learning, no matter it is teacher or student, member is called learner as long as it receives knowledge. For example, student needs preview before class, prepare knowledge and learn from teaching. (6) Mentor: it is member who gives support in physical and mental aspects in E-learning. For example, emotional communication and teacher concerns students actively. (7) Information technology: it refers to the influence of information environment on teaching. For example, advantages and disadvantages of students and teachers in information quality and E-learning. (8) Learning and mental output: it refers to mental feeling and learning effect when network member uses E-learning. For example, haste, willingness of continual teaching, self-expectation and loneliness of teachers. (9) Personal characteristics: personal characteristics of members who use E-learning. For example, learning attitude, teacher enthusiasm and teaching style.

Axial coding organizes and structures different categories by considering space and time, culture and technology factors, which is a process of gradually linking relations among each category together. 9 categories are found from open coding, and logical analysis is made on such categories by using axial coding. According to conditions, clues, action/interaction strategies and results to be analyzed, each category is linked together and relevance among categories is found. For example, personal characteristics of students and teachers presented under E-learning environment will affect 4 roles they are playing in teaching activities -- manager, instructor, learner, and mentor. For example, E-learning activity is one where teachers and students undertake teaching and learning activity through information technology. Except affecting 4 roles including technician, manager, instructor and learner, E-learning activity is relevant with such categories due to learning and mental output generated in learning activity. This study conducts relevance analysis on categories classified under open coding, to establish a role and interactive mode of teachers and students under E-learning environment by using such 9 categories, seen in Figure 2 below.

After using open coding and axial coding, selective coding is used to integrate all categories developed from above phases together, in order to find core category. Selective coding is used to pick out core category and link core category with other categories in systematic way, a process of validating such relations. The core category in this study is roles teachers and students play in E-learning and their interaction, which connects topics and central ideas in this study, affect all categories and further influence the frame interpretation in whole study.
Coding results acquired from grounded theory include following features: first, regarding teacher and student’s role, teachers produce teaching material and deliver knowledge to students under E-learning environment by means of information technology. Except delivering knowledge, teachers must instruct students to use information tools as supplementary way in learning, thus teacher is technician and instructor. Because teacher is responsible for creating content in teaching material, assigns homework and activity to students, he is also manager. In addition, teacher is not versatile in providing knowledge. Sometimes, he learns different knowledge, ideas and technology as student, so he is also learner. Finally, teachers need to take care of students, play the role of instructor in mental consulting. Second, regarding students, students receive technology, knowledge and instruction delivered by teachers in E-learning, who play the role of learners. When students come from different regions and backgrounds, they have their special fields, provide learning resources to others, instruct others and teachers in solving problems or solve technology problem by themselves. At this time, students play the role of instructor, manager and technician. Moreover, if students get along well with teachers, students will say supportive words to teachers, or encourage other learners with empathy, so student is also instructor. The above relations are summarized in Figure 3.

**Figure 2** Axial Coding: The Interaction Model of Teacher and Student Role Redefinition in E-learning Environment

**4. Research results**
After interview data is organized and analyzed, teachers and students play 5 roles in E-learning, namely technician, manager, instructor, learner and mentor. Regarding the role of instructor, learner and mentor, teachers and students show the same behavior, whereas in technician and manager role, due to differences in identity and status, they show different behaviors. Regarding the role of instructor, teachers and students both provide knowledge that others are not familiar. Regarding the role of learner, teachers and students must learn what they are not familiar with. Regarding the role of mentor, they both give support and encourage to others. However, regarding the role of technician, though both of them instruct others in technical operation in teaching platform, teachers also bear the responsibility of managing and controlling platform operation, making curriculum proceed smoothly. For example, teacher should open online meeting room, team discussion zone and control teaching white board. Moreover, regarding the role of manager, though teachers and students provide teaching resources, teachers still have more extensive teaching responsibility. For example, teachers should design online voting questionnaire in advance, design learning material, solve disputes of students in learning and make arbitration when different opinions are uttered. Students need managing their learning progress. Therefore, though they play 5 roles, they don’t have completely similar behaviors, differing in behaviors due to identity and status as to partial roles. The above data is summarized in Table 1.
Table 1 Teachers and Students’ Role and Behavior in E-learning Environment

<table>
<thead>
<tr>
<th>Roles</th>
<th>Behaviors</th>
<th>Similarity</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical</td>
<td>Teachers and students should be an user to operate common functions on the E-learning system.</td>
<td>Teachers should be an expert to operate and manage the learning system.</td>
<td></td>
</tr>
<tr>
<td>Manager</td>
<td>Both teachers and students are information providers to manage the activities on the E-learning system.</td>
<td>The teachers have to create teaching material, solve the problems, arrange the learning process and manage the activities on the E-learning systems. However, the students just manage individual learning stages.</td>
<td></td>
</tr>
<tr>
<td>Instructor</td>
<td>Both teachers and students provide valuable knowledge to share with others on the E-learning system.</td>
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</tr>
<tr>
<td>Learning</td>
<td>The teachers and students could learn knowledge form their doing in the E-learning system.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mentor</td>
<td>The teachers and students give the warm and listen to each other.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Teacher and student’s role in E-learning is more diversified and complex than it was before. Learning environment, learning way, information environment, difference between self-expectation and expectation given by others all contribute to changes in personal roles. Pedersen and Thomas (2003) pointed out that personal frame varies with environment or changes when shared with others. Frame doesn’t affect definition of teachers and students on self-roles, but also affects how to teach for teachers and how to learn and what to learn for students. Interpretation on E-learning also affects interaction among people in teaching platform, how to show themselves in platform as well as understanding roles others are playing. Traditional teacher and student know how to play their role respectively from the past experience. However, when confronting new technology environment, teaching method and policy issues, teachers and students must constantly reconstruct their frames.

This study applies the definition of technology frame to understand the influence of teaching experience of E-learning members, knowledge and teaching affairs concerned by them on E-learning when the organization is applying technology. Next, it describes role changes of students and teachers in E-learning according to change patterns caused by applying technology into organization which is proposed by Orlikowski and Gash (1994). After comparing results of interview cases with roles of teachers and students playing in tangible classroom summarized by literature, it is divided into three categories: (1) fully intended -- it means the role-play of teachers and students in E-learning is similar with
those playing in tangible teaching indicated by the past literature. (2) Partially intended -- it means when comparing teacher and student’ role is compared with those in tangible teaching indicated in the past literature, it finds teacher and student is lacking of one role in E-learning. For students, because they play the role of learner in E-learning and tangible teaching, this category doesn’t exist. (3) Non-intended -- it means except teacher and student’ role indicated by the past literature, they still play other roles in E-learning or they have expectation about the roles they should play.

This study finds that teachers and students play 5 roles in E-learning respectively, namely, technician, manager, instructor, learner and mentor. Teachers and students don’t necessarily have such 5 roles. However, there is still expectation and demands on their roles. Hereby the results of cases in this study are summarized in Table 2.

**4.1 Teacher’s role**

According to organized literature, teachers play 3 roles in tangible classroom in the past: (1) instructor (2) mentor (3) manager. This study concludes that teacher play the following roles in E-learning on the basis of interview results: (1) instructor (2) mentor (3) manager (4) technician (5) learner.

**4.1.1 Fully intended**

Fully intended means that teacher’s role in E-learning is the same as tangible teaching, including instructor, mentor and manager. However, the results of cases in interview in this study show that there is not any teacher who believes their role in E-learning is completely similar with that in tangible teaching. A majority of cases shows that except 3 roles in tangible teaching (instructor, mentor and manager), most teachers play other roles. Moreover, other cases show it is not necessary for playing 3 roles of tangible teaching under E-learning environment. Therefore, teacher’s role in E-learning is different from tangible teaching.

**4.1.2 Partially intended**

Partial cases in interview show that under E-learning environment, due to limitation in application of information technology, teacher’s role lacks of instructor. They play the role of instructor and manager. In tangible teaching, teachers can deliver teaching content and atmosphere to students in face-to-face way, control responses of students in real time, and give supports and concerns to students. However, E-learning applies technology as a communication and interaction media between teachers and students, so it can’t compare with face-to-face teaching in aspect of delivery effect. In E-learning, teachers are worse at controlling learning atmosphere for students, and feel it is uneasy to stimulate them. In teaching aspect, it presents there is a weak emotional infection force among groups and bad teaching accomplishment. For example, teacher with Teacher No. TM08 says, “In
### Table 2: Comparing the Difference between Roles in the Physical and Virtual Class

<table>
<thead>
<tr>
<th>Teachers’ roles</th>
<th>The roles in the physical class</th>
<th>The roles in the virtual class</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
<td>Aligned Intended Change</td>
<td></td>
</tr>
<tr>
<td>Instructor, mentor and manager</td>
<td>Instructor&amp; Manager</td>
<td>Partial Intended Change</td>
<td></td>
</tr>
<tr>
<td>Instructor &amp; Mentor &amp; Manager + Technical</td>
<td>Un-intended Change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructor &amp; Mentor &amp; Manager + Learner</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructor &amp; Manager + Learner</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructor &amp; Manager + Learner * Technical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructor (Liu et al., 2005; Coppola, et al., 2002; Lam and Lawrence, 2002; Berge, 1995)</td>
<td>Mentor (Liu et al., 2005; Coppola, et al., 2002; Berge, 1995)</td>
<td>Manager (Xiao et al., 2005; Liu et al., 2005; Berge, 1995)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Students’ roles</th>
<th>Learner</th>
<th>Aligned Intended Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Learner + Manager</td>
<td></td>
</tr>
<tr>
<td>More than one kind of roles</td>
<td>Learner + Manager + Technical</td>
<td></td>
</tr>
<tr>
<td>Learner + Manager + Mentor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learner * Manager</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learner * Instructor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learner * Technical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learner + Manager * Technical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learner + Technical * Manager</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learner + Manager * Instructor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learner + Manager + Technical * Instructor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learner (Lam and Lawrence, 2002)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(& Pre-intervention roles; + Un-intended roles; *Intended roles)
traditional class, I can tell some jokes, so it is more flexible. In E-learning, though I teach students orally, due to network mode, sometimes, something made in traditional university can't be realized in E-learning. For example, I can walk around or present what I am talking about by using something visible to students." Therefore, in E-learning, teacher lacks of the role of instructor compared with tangible teaching. Teacher's role as instructor and manager is similar with that in traditional teaching, who must provide and manage learning material, content, atmosphere and progress.

4.1.3 Unintended

After cases are organized and analyzed, there are 4 unintended categories: (1) Except playing the role of instructor, mentor and manager in traditional teaching, teacher should be also technician. (2) Except 3 roles in traditional teaching (instructor, mentor and manager), teacher should be also learner. (3) Except partial intended roles (instructor and manager) above, teacher should be also learner. (4) Being similar with the third category above (playing the role of instructor, manager and learner), teacher should be expected to be technician.

Regarding the role of instructor, though E-learning is not restricted in time and space, for students who are accustomed to tangible teaching whereas not familiar with information technology, they may not join in or get acquaint with E-learning activities. At this time, the teacher must play the role of instructor. Except encouraging participation of students into E-learning, they should help students merge into teaching activities by means of activity design. For example, the teacher with Teacher No. TM03 mentions that “At the beginning of this term, students are unacquainted with each other. In traditional classroom, though we meet student who is introversion, it is easy for him because he sees all classmates at least. However, in E-learning environment, for students who are introversion, it is difficult for him to get along with others. So, it needs some ice-breaker activities. These activities are established by teachers. Though it is irrelevant with curriculums, such activity can enhance familiarity among students and even make him get familiar with the whole environment of platform. It is beneficial to the learning of students in platform in future.”

Regarding the role of technician, a part of teachers indicate that when conducting E-learning, it must consider technical problems caused by student quality. In the interview, it shows, teachers think they are not only technique solver but also teaching assistant. For example, the teacher with Teacher No. TM05 mentions that “Teachers have many rehearsal and teaching methods. They may consider technique problems, including inexperienced students. So, when taking class, they should spend some time in guiding students how to use this synchronous teaching system.” Also it is said by teacher with Teacher No. TM07 that “It must understand adaptability of students toward network or
their habits, skills and experience in surfing online, to decide the teaching and interaction methods of teachers. If students are not familiar with surfing online, we should teach them from their standpoints. Even a description will be made before class. It must eliminate such disturbance. It could almost say we play the role of teacher and teaching assistant.” Moreover, other teachers also indicate that currently, not everyone could play the roles above, but they expect they could make it in future. The teacher with Teacher No. TM04 mentions that “Computer and network are inevitable. People who don’t use internet become less and less. To the end, stubborn people still use it. For older teacher; they are slow at learning achievement, of course, but if they are persistent, plus incentive mechanism in school and assistance from other students who are experts at information field, E-learning will keep pace with classroom teaching, popularized.”

Regarding the role of learner, there is a big difference between E-learning and traditional tangible teaching. Teachers must constantly adjust teaching methods, share experience with other teachers and emulate to achieve higher level of network teaching. Therefore, in the interview, a majority of teachers indicate that E-learning teacher must play the role of learner. For example, the teacher with Teacher No. TM01 says that “Currently, there is no standard training telling teachers how to do it by providing them experience of others or formal guidance on strategy and methods in E-learning, so after making many tries and getting knowledge about it, teacher can have a way of dealing with it on his own.” The teacher with Teacher No. TM04 also mentions that “I always watch others how to do it in similar curriculums and network teaching material and teaching method in other subjects. I learn from them and simulate, learn from doing, so as to arouse my interests and get thoughts, and enhance E-learning quality.”

Regarding topic of frame change, though at the beginning, teachers are not familiar with E-learning technology, finally, they could apply their roles into E-learning successfully through constant learning and changing existing appearance and concepts established on the basis of their teaching experience in the past. Otherwise, when there is a significant difference between individual value concepts of teachers and expectation and responsibility given by school policies, it may generate role conflict, making them not integrate into E-learning environment. For example, teachers believe education training or technique problem related to the system should be treated by exclusive technique support department. However, some teachers are not given support in this aspect or they are required to undertake the role of technician, causing teachers not knowing what to do when facing E-learning environment and generate self-role conflict.

4.2 Student’s role

In the past learning environment, all knowledge and information obtained by students are dependable on teachers. Students don’t have control rights in learning and
also they are non-autonomous learners. In this study, the roles of students playing in E-learning summarized by interviews are: (1) learner, (2) instructor, (3) manager, (4) technician, (5) mentor.

4.2.1 Fully intended

In cases in this study, a part of students believe in E-learning, teaching platform provides many learning resources to students for use. However, in aspect of technique operation, they think it is no big deal as long as they learn. Thus in E-learning, students are only pure learners who acquire knowledge and academic degree by using the platform. For example, the student with Student No. SM21 shows “Learning resources are occupied by a majority of teachers. Because teacher is expert in a curriculum, they provide more learning resources. ... Operation technique is not sophisticated too much. ... We are purely operating this system. We can't change it like system developers. Everyone just operates the system.”

Regarding the role of learner, though students play the role of learner similar with that in tangible teaching, what is different from the past is learner should have active and double-direction learning spirits, who are not single-direction and passive learner. Students are able to share their experience and knowledge with others and ask questions and find solutions actively. For example, the student with Student No. SM03 shows “E-learning is synchronous and synchronous. Sometimes, it is proceeding at the same time. For those matters encountered in daily life, e.g., learning experience or thoughts related to curriculums, or relevant data seen, could be posted on teaching platform online in real time. ... It makes me feel learning could be done anywhere.”

4.2.2 Non-intended

After cases are organized and analyzed, there are 2 unintended categories: (1) Except traditional role, more than one role should be played. For example, student is manger, or manager and technician at the same time or manager and mentor. (2) Except traditional learner role, student plays other roles, and expects others to play other roles in E-learning. For example, he expects him to be learner and others to be technician, or he expects him to be learner and technician, and others to be manager.

Regarding the role of manager, E-learning transcends limitations on time and space, highlights how to control learning progress by students themselves. For example, the student with Student No. SM08 shows “E-learning ... allows you to acquire, browse and review curriculums established on it at any time. Also, the flexible office hour once every week ... allows it is very easy to allocate time.” The student with Student No. SF22 mentions that “In synchronous learning, because the teacher posts curriculum content on network and allows us to watch at any time. If we don’t know about it, we
can click it and watch it. There is no time limitation.” Additionally, if playing the role of instructor, students can find various interesting or novelty teaching material from network. Regarding the supply of learning resources, students can provide resources to other students and behave as manager or instructor of teaching material. For example, the student with Student No. SM07 says “I can get some information from other students. Sometimes, students post some data online. Because we don’t have enough time to find data, we can use those supplied by our classmates.” The student with Student No. SM17 also says “Students will share more data when conducting E-learning. Basically, it could achieve a level that teaching benefits teachers and students. In information and many other fields, teachers can’t know everything in each field.” Therefore, except the role of learner, students in E-learning also undertakes manager or instructor role or experts others to become manager or instructor.

Regarding the role of technician, one feature in E-learning environment could be that students are superior to teachers in aspect of technique operation. For students who are skilful at technology, they could be learner and technician, to instruct teachers or other students who are not familiar with techniques. For example, the student with Student No. SM01 says “One feature in E-learning is students are better in technology operation than teachers. In this case, teachers must change their roles into learner. Students need changing their roles into teacher, possibly to teach their professors how to solve one problem in aspect of technology.” The student with Student No. SF04 says “Student’s role may change into teaching assistant. This happens too; teacher’s role doesn’t change. When student is superior to teacher in his technique, teacher is still professional in major classes. As for technique, of course, the case that student is superior to teacher is very high. It is impossible that every teacher is good at using remote teaching tools. So, student’s role could be teaching assistant, to help teachers instruct other students how to use the system.” Besides, due to different experience in E-learning, some students adapt themselves to E-learning process slowly when they are learners. If students play the role of technician, to help classmates who are not familiar with E-learning platform, they also play the role of instructor. For example, the student with Student No. SM20 mentions that “Generally, students help those who have insufficient experience in E-learning among groups and classmates, e.g., technology use or use of some discussion versions as well as the use of teaching platform.” Therefore, learner can be also technician or instructor or expect others to play such roles.
5. Conclusions

What is discussed in this study is how teacher and student explain their roles and other’s roles in E-learning. Firstly, through grounded theory discussion, it is found that teacher and student plays 5 roles in E-learning, including: (1) instructor, (2) manager, (3) mentor, (4) technician, (5) learner. Teachers and students have similar roles but also similar behaviors in aspects of guidance, technology and learning roles. However, regarding teaching and management roles, except having similar behaviors, due to differences in identity and status, they show differently. In the phase of selective coding, this study establishes teacher and student’s roles and their interaction mode in E-learning environment. According to frame theory, it discusses role changes of teachers and students after E-learning is applied. Findings in this study contain major two parts:

Firstly, regarding the role of teaching, what is different from traditional teaching role in the past, teachers tend to instruct students how to learn rather than control the whole learning process as instructor. It is just mentioned by a student “Professor’s role is an agent rather than a teacher from beginning to the end.” and “Teacher doesn’t give exhortations into their ears like before in E-learning.” Allan (2002) and Lam and Lawrence (2002) believe that controlling rights of teachers in E-learning will gradually reduce. Regarding the role of manager, teachers must join in many teaching matters, e.g., produce teaching material, undertake owner in discussion board, and solve disputes of students in aspect of speech. Regarding the role of mentor, teachers should say encouraging and consoling words to students when they are depressed about E-learning. Regarding the role of technician, teachers must have basic technique skills and solve technique problems encountered by students. Regarding the role of learner, as it is pointed out by traditional teaching literature in the past, teachers should receive education and training again, to obtain new learning strategy, teaching skill and technology perspective. In conclusion, though it is not necessary for teachers to control the whole learning process, the teaching responsibility of teachers never lessens.

In E-learning, student plays the role of learner who interacts with others in double directions. Learner believes that one should have spontaneous learning spirit in E-learning to get fruits. Students also play the role of manager because they can control their learning progress, learning time and required learning resources. Furthermore, they could use their information skills to solve problems they meet or others meet, so they also play the role of technician. Students could teach the knowledge they know to others in E-learning, and also play the role of instructor. Through interaction during learning, students could give support and encouragement to others, playing the role of mentor. In holistic view, comparing with learning environment in the past, in E-learning students are more active learners, playing the role more than learner. For learning interaction, most students could
interact with others and learn through synchronous or asynchronous activities. Few students still believe E-learning can’t totally replace face-to-face teaching. It is impossible to establish close relationship with others through E-learning platform.

Second, regarding frame change, compared with data in traditional teaching literatures, it finds there is no role in E-learning totally similar with that in traditional teaching literature. Possibly due to changes of teaching place, teacher plays the role of instructor and technical support. As for the roles partially intended, it find teacher doesn’t play the role of mentor in E-learning. Additionally, teachers’ view on the application of technology into teaching is that technology doesn’t only change manifestation method of teaching material. Because E-learning lacks of visual clues in traditional teaching, teachers can’t walk around under the platform like before, seeing learning status of students. As for unintended roles, there are two changes. Firstly, comparing literatures related to teacher and student’ role in E-learning, this study observes that teacher also undertakes the role of technician in E-learning. However, it also finds teacher’s role as learner in E-learning. In this role, teacher doesn’t only want to study further in other time, but he is desired to learn with students, and achieve the goal of teaching while learning. Second change is, though some teachers don’t play the role of technician in E-learning, they will expect they could become technicians in future. Teachers believe that they could achieve the teaching effect in E-learning curriculums in future, which is similar with the past traditional teaching if they get assistance and guidance in aspect of technology from others. After comparing with the traditional literature related to student’s role, it finds student still purely plays the role of learner in the process of E-learning. A majority of students are not only learner in E-learning but also generate unintended roles. For investigating its reasons, E-learning platform provides students with more autonomous and diversified learning activities and learning methods. Compared with learning way of sitting in classroom in the past, students will show more diversified roles in E-learning platform. When students are talking about the most helpful event or experience in E-learning, most of them mention mutual assistance among students as the most helpful event, which is called interaction among team members. When learners are experts in various fields, they don’t contribute their knowledge in the process of learning but also assist others in solving neck-bottle problems. Which is the same as traditional face-to-face teaching, learners join in many social activities and maintain good friendship with each other.

There are several contributions according to results in this study as follows: (1) this study helps teachers who intend to put themselves into E-learning understand teacher’s role in E-learning and teacher’ role expected by students or school in E-learning. When teachers know clearly about their expectation given by others, it could effectively reduce the possibility of role conflict or role obscurity. (2) This study finds in learning, teaching and instruction role, teachers and students play the same roles and have similar behaviors.
In the role of manager and technician, though teachers and students play the same roles, there is still difference in their behaviors. For teachers and students who make slow progress in E-learning, this study suggests it should try to use the existing experience in tangible teaching to promote teachers and students’ participation in E-learning activities more actively.

Except defining and discovering participator’s role in E-learning, this study also initiates more interesting research topics in future. For example, for teachers who play the role of instructor in E-learning, how personal role affects personal teaching style? How teaching style of individuals on network affect teaching performance? It is worth of investigation in teaching style and achievement solicited by new teaching media and method in future.

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References


Using Grounded Theory to Redefine the Role of Teacher and Student in the E-learning Environment


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Interview Questionnaire -- for teachers

Demographic

Sex: □ Male □ Female

Teaching experience:

□ Less than one year □ 1~3 years □ Over 3 years

Position:

□ Instructor in the virtual class □ Instructor in the physical class
□ Designer of teaching material □ Technical support □ Trainer

Items

1. Please define E-learning and describe its characteristics.

2. Some teachers believe the role of the teacher and teaching strategies change in the virtual class. Do you agree with that? What has changed for you?

3. How do you enable students to focus on discussion about a specific issue in synchronous and asynchronous learning systems?

4. How do you encourage your students to share their opinions in synchronous and asynchronous learning systems?

5. Are you satisfied with the quality of your teaching in the E-learning context?

6. Do you think your students gain more or less in the virtual class compared with the physical class? Please give your reasons.

7. When you adopt the E-learning system of teaching, how do you feel? Do you engage in the activities in the virtual class or do you feel somewhat isolated? Please give your reasons.

8. How do activities and participants’ behaviors differ in the virtual class compared to the physical class?

9. How does using the E-learning system affect your relationships with colleagues?

10. How does using the E-learning system change your design of teaching material or arranging of teaching activities?
11. There are numerous activities and exercises on the E-learning system. Do these activities and exercises promote teamwork or individual work? How do students respond to the type of work promoted by these exercises?

12. Do you think the activities on the E-learning system are clearly defined? How do you ensure that your students understand the goal of these activities and encourage them to participate in them?

13. What do you gain from the E-learning system resource?

14. Do you have any experience of designing for your students successful innovative activities in the virtual class? If so, please describe the activities.

15. Have you experienced any challenges in the virtual class?

16. Have you ever failed to manage the E-learning system? If so, please describe your experience(s).

17. Would you be willing to teach classes through the E-learning system again? Please explain why or why not.
# Interview Questionnaire -- for students

## Demographic

1. **Sex:** □ Male □ Female
2. **Ages:** □ 18~24 □ 25~29 □ 30~34 □ 35~39 □ 40~44 □ 45~49 □ 50~54 □ 55~59 □ 60~64 □ 65+
3. **Location:** □ North □ Middle □ South □ East
4. **Do you have any experience of using the E-learning system?**
   - □ Yes □ No (Jump to No.6)
5. **How much experience do you have of using the E-learning system?**
   - □ less than 1 year □ 1~3 years □ 3~5 years □ Over 5 years
6. **Do you have any work experience?** □ Yes (Jump to No.7) □ No
7. **How much work experience do you have?**
   - □ less than 1 year □ 1~3 years □ 3~5 years □ Over 5 years

## Items

1. **In the classroom, what is your responsibility?**
2. **What are the technical skills and personal traits necessary to be a student in the virtual class? What are most important skills and personal traits?**
3. **How confident are you in using the E-learning system?**
4. **How do teachers instruct you in the virtual class?**
5. **What kind of activities do teachers design for students in the virtual class? How do students respond to these activities? What are the teachers’ reactions to the students’ responses in the virtual class? Who leads the learning process?**
6. **Please define the role of the teacher in the E-learning system. How does the teacher’s E-learning role differ from their role in the physical class?**
7. **How do your learning activities, learning performance and learning attitudes in the virtual learning context differ from those in the physical classroom context?**
8. Do you think you gain more or less in the virtual class compared with the physical learning context? Please explain.

9. When you use the E-learning system, how do you feel? Do you engage in the activities in the virtual class or do you feel somewhat lonely? Please explain the reasons for your answer.

10. Since using the E-learning system, have you improved your learning performance? If you have, please provide some examples.

11. How do you interact with your teachers and classmates in the virtual class?

12. Do you think the activities on the E-learning system are clearly defined? What have you gained from the E-learning system resource?

13. Do you enjoy learning in the virtual class? Do you think it is a successful system of learning? Please explain why or why not.

14. How do you use technical tools (e.g., PowerPoint, audio, video) to assist your learning?

15. When the students’ technical skills are better than the teachers’, how does this change the students’/teachers’ roles?

16. When you are new to the virtual class, do you need any support from the teacher? What are the differences in terms of need between you as a new virtual class student and you as a senior student? Do these E-learning activities differ from those provided in the physical class?

17. Do you have any positive experiences of the virtual class? What are they?

18. Do you have any negative experiences of the virtual class? Have you attempted to resolve these problems?

19. What is your personal experience of the virtual class? (positive, negative, or attractive)

20. What are your classmates’ experiences of the virtual class? (positive, negative, or attractive)