CHAPTER II

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

This research studies about online learning environment based on social constructivist theory for pharmacy students in community pharmacy course. In this literature review, learning theories are explored; the weakness and strength of each theory is also presented. Details of Lev Vygotsky and his philosophy are described. The higher/complex mental function, which developed by mastering the signs and symbols of the culture, is explained. The higher/ complex mental function becomes an important instrument for structuring and managing thought. Social constructivism is the main theory of this study. In Vygotskian perspective, learning is based on student's interaction and scaffolding from more capable peers or expert to overcome the zone of proximal development. This concept facilitates higher/complex mental function and now increasingly applied in online course. There are many researches illustrated the numerous studies explored various aspects of on-line learning as shown in the last part of this review.

2.1. Learning theory

A learning theory has been gaining attention among educators. Learning's philosophy presents an individualistic process linked to a person's own ability to construct schema using perceived experiences as the building blocks (Brent Wilson, 1995). Learning theory is an essential element in the preparation of instructional design professionals (Schiffman, 1995). Depending on the learners and learning situation, different learning theories are applied.

After the early 1950s, Educators were extensively interested in studying learning theory, from the mid -80s to the present is the rise of social, cultural, and personal factors in learning.(Gredler, 1997; Wink & Putney., 2002). Major learning theories were presented as follows.

2.1.1 Behaviorism

This learning theory presents that learning consists of patterns, memorization, and imitation (Gredler, 1997; Wink & Putney., 2002). Behaviorism focuses on a new behavioral pattern being repeated until it becomes automatic. This type of learning can be seen as a response to an outside stimulus, and is reinforced by extrinsic reward. It views the mind in the sense that response to stimulus can be observed quantitatively, totally ignoring the possibility of thought processes occurring in the mind. The educational applications of behaviorism to enhance achievement are numerous. School use programmed instruction that is organized into separate, sequentially ordered units of study, accompanied by unit tests, opportunities for feedback on performance, and chances to practice skills. These are conditionally organized as "if...,then...."

2.1.2 Cognitivism

This theory based on the thought process behind the behavior (Mergel, 1998). Changes in behavior are observed, and used as indicators as to notice what is happening inside the learner's mind. Compare to behaviorism, cognitivism is a philosophical orientation based on the belief that people actively construct their knowledge of the world through experience and interaction rather than through behavioral conditioning (Chen, 2004; Hirst, 1983). Cognitive learning theorists focus on the human mind's active attempts to make sense of the world. Cognitive theorists acknowledge the importance of reinforcement, although they stress its role in providing feedback about the correctness of responses over its role as a motivator(Bednar, Cunningham, Duffy, & Perry, 1991). Teachers accept to engage students in active learning. The role of attention, retention of information and learning, connecting new knowledge with old knowledge were all associated with various cognitivists. Students are asked to engage more cognitively with their learning. Extrinsic rewards began to shift toward intrinsic motivation.

Cognitivism began shifting to a much more interactive process that led to the constructivist or interaction's approach, which assumed the inter-relatedness of behavioral and mental process with the environment (Mergel, 1998). In cognitive viewpoint, the environment is back-grounded and not an integral part of what is being learned. One difference from behaviorism and cognitivism, which emerged with the constructivist lens, was that it assumed that the individual was doing the constructing

within the mind, perhaps in relationship with others. Additionally, the cognitive viewpoint does not include a theory of culture, so it assumes individual differences to be capability differences (Wink & Putney., 2002).

2.1.3 Constructivism

Constructivism based on the premise that we all construct our own perspective of the world, through individual experiences. Constructivism focuses on preparing the learner to problem solve in vague situations. Bartlett (1932) pioneered what became the constructivist approach(Good, 1990) Constructivists believe that learners construct their own reality or at least interpret it based upon their perceptions of experiences, so an individual's knowledge is a function of one's prior experiences, mental structures, and beliefs that are used to interpret objects and events. What someone knows is based on the physical and social experiences which are comprehended by the mind (Jonassen, 1991).

If knowledge is individually constructed, then the role of learner is an experimenter, a researcher, constructing and testing hypotheses. The role of the teacher is the "guide on the side" to help each individual come to her own conclusions about experiment. Classrooms will be set up so that students can move to learning centers to work on experiments, but not necessarily with each other (Gredler, 1997).

From a Vygotskian perspective, the social constructivist lens enables us to see cultural component of language use in relationship to others(Wink & Putney., 2002). This relationship is not only social and cultural but also historical, because we use the cultural tools of communicative signs and symbols to delegate us construct our learning. In social constructivist viewpoint, individuals whose purpose is to share their expertise in order to construct and negotiate meaning collectively construct knowledge.

The learner's role in social constructivism is to bring what they already know into relationship with new information through interaction with others. The teacher's role acts as a more experienced leader, and an investigative reporter. The purpose is different because the responsibility of the teacher is to facilitate the students' learning process and to co-ordinate the learning with others around a particular content. In the Vygotskian perspective, teachers are learners and learners are teachers. Learners

reflect on their practice and learners also act on their reflections (Hirst, 1983; Jonassen, 1991; Wink & Putney., 2002)

The Assumptions of Constructivism (Bednar et al., 1991; Smorgansbord, Undated)

- Knowledge is constructed from experience
- Learning is a personal interpretation of the world
- Learning is an active process in which meaning is developed on the basis of experience
- Conceptual growth comes from the negotiation of meaning, the sharing of multiple perspectives and the changing of our internal representations through collaborative learning
- Learning should be situated in realistic settings; testing should be integrated with the task and not a separate activity

Table 2.1 Compare the differences of three theories. (Chen, 2004; Wink & Putney., 2002)

Construct	**Behaviorist-derived**	**Cognitive constructivist (Piaget)**	**Social constructionist (Vygotsky)**
Knowledge	Fixed body of knowledge to acquire	Changing body of knowledge, individually constructed in social world	Changing body of knowledge, Mutually constructed with other.
Learning What	Acquisition of facts, skills, concepts	Active construction, restructuring prior knowledge	Collaborative construction of socially / culturally defined knowledge and values
How	Through drill and guided	Through multiple opportunities and diverse processes to connect to what is already know	Through socially and culturally constructed opportunities, tying to students' experience
Where	Within individual's head	In interaction with others and environment	In collaboration with others through the social / cultural Setting
Teaching	Transmission, presentation, telling (sage on the stage)	Challenge thinking toward more complete understanding (guide on the side)	Co-construct knowledge with students by sharing expertise and understanding (actuator of learning)

Construct	Behaviorist-derived	Cognitive constructivist (Piaget)	Social constructionist (Vygotsky)
Motivation	Rewards, grades, jobs	Self-development, competence	Collective and individual development through collaboration
Role of Teacher	Manager, supervisor	Facilitator, guide	Mediator, mentor, actuator
Actions	Encourage on-time task completion, correct wrong answers	Create opportunities for interacting with meaningful ideas, materials, others	Construct with students opportunities for interacting with meaningful ideas, materials, others
Role of Peers	Not usually considered or rigidly structured	Not necessarily encouraged, but can stimulate thinking, raise questions	Assume part of knowledge construction, contribute to define opportunities for learning
Role of Student	Passive receptor of information	Active construction within mind	Active co-construction, with others and self-negotiating meaning
	Worker	Generator, constructor	Co-generator, co-constructor, Re-formulator
	Active listener, direction follower	Active thinker, explainer, interpreter, questioner	Active thinker, explainer, interpreter, inquirer, active social participator
Summary	Stimulus and response – Students remember and respond (change in overt behavior due to conditioning) – Teachers present and provide for practice and feedback	Cognitivism; information transmission and processing – Students remember strategies, rules and patterns – Teachers plan for cognitive learning strategies Constructivism; personal discovery of knowledge – Discover relationships between concepts, e.g. addition and subtraction – Teachers provide instructional context for active and self-regulated students.	Learning is a social construction, mediated by different perspectives – Through authentic projects, students discuss and discover meanings, e.g. concept of multiplication – Teachers provide facilitation and scaffolds among for the students

2.2 Social constructivism

Lev Vygotsky was born in Orsha, a town in western Russia in 1896. He was a psychologist, the main architect of social constructivism (Jonassen, 1996). His works spanned the brief period from 1924 to 1938. Vygotsky's finding has steadily grown prevalent over the United States since the early 1980s. Vygotsky was not trained in science but received a law degree from the Moscow University in 1917(Gredler, 1997; Ratner, ; Wink & Putney., 2002). He had also studied philosophy, psychology, and literature at the Shanyavskii People's University. In addition, he read extensively in a variety of fields, including political science and history. Later, he became interested in learning disabilities and similar problems, then he entered medical school, focusing on neuro-physiological studies. Many of Vygotsky's ideas speak directly to the issues of education and other applied fields. He developed a new theory toward the development of consciousness, which was opposing to the behaviorism by Pavlov presented during that time. In 1934 he had an acute attack of chronic tuberculosis and died at the age of 37. A few of Vygotsky's writings were published after his death, some were not published until 1956 (Gredler, 1997; Wink & Putney., 2002) .

Vygotsky first contrasted animal and human behavior (Gredler, 1997). Animal behavior consists of only two groups of responses: innate reflexes and acquired or conditioned reflexes. In contrast, human behavior includes three types of experience. First is a type of inherited experience that is broader than the innate responses of animals. It includes the experience of former generations, or *historical* experience.

Second is the large number of associations formed in the experience of others. Vygotsky named this component *social* experience. The third type of unique experience is the way that humans adapt to the environment. Specifically, animals engage in passive adaptation to the environment, whereas humans actively adapt the environment to themselves (active adaptation). Vygotsky named this behavior *repeated* experience. It enables humans to develop active forms of adaptation that are not found in animals.

Given these differences between animals and humans, Vygotsky called on psychology to describe the development of the abilities and accomplishments that are uniquely human (Vygotsky, 1979). He noted that this effort would be successful only if psychology undertook an analysis of human consciousness in all its

dimensions. In this way, the human abilities of self-awareness, categorical perception, self-regulated behavior, logical memory, and others could be understood.

The Vygotsky's socio-historical theory has just received considerable attention in the United States in recent years (Palincsar, 1998). Vygotsky outlined a conception of development that assigns a primary role to culture in the learning process. His theory raises important questions about meaning, communication, and thinking that are particularly relevant in a media–oriented culture. He proposed that social interaction actually influences cognitive development. Vygotsky approached development differently from Piaget. Piaget believed that cognitive development consists of four main periods of cognitive growth: sensorimotor, preoperational, concrete operations and formal operations. Piaget theory suggests that development has an endpoint goal. Vygotsky, in contrast, believed that development is a process that should be analyzed instead of a product to be obtained. According to Vygotsky, the development process that begins at birth and continue until death is too complex to be defined by stages (Gredler, 1997; Palincsar, 1998; Wink & Putney., 2002) . Vygotsky emphasized the higher/complex mental functions of categorical perception, logical memory, conceptual thinking, and self-regulated attention. The development of these capabilities is determined by the socio-historical heritage of the child's culture and the child's social experience. They are the uniquely human capabilities. The higher/ complex mental functions differ in a variety of ways from the primitive functions (involuntary attention, simple perception, and natural memory) that are biological in origin.

The primary difference between the primitive and higher/complex mental functions is that the integral relationship of the stimuli and reactions in a single complex is disturbed. The sign and the method of sign's use are the focus the entire process (Vygotsky, 1966).

Table 2.2 A comparison of primitive and higher mental functions (Gredler, 1997; Vygotsky, 1966)

	Primitive Functions	**Higher Mental Functions**
1.Processes	Simple perception, natural memory, involuntary attention	Categorical perception, logical memory, conceptual thinking, self-regulated attention
2.Source of control	Stimulation from the environment	The use of both "object stimuli" and "means stimuli" by the individual to master and control his or her own behavior
3.Dynamics	Co-occurrence of two stimuli	Creation of new links through the individual's artificial combination of stimuli
4.Defining characteristics	Immediacy; bounded by concrete experience	Characterized by conscious awareness (of the processes). abstraction, and control
5.Thinking and reasoning	Determined by natural memory; limited to reproducing established practical situations	Abstract, conceptual; makes use of logical relations and generalizations
6.Origin	Biological factors	Socio-historical development

The key to the development of complex/higher mental functions, as mentioned by Vygotsky, is mastering the signs and symbols of the culture and learning to use them to direct and regulate one's own behavior. As a result, the nature of the child's cognitive functioning is socially determined.

The development of complex/higher mental functions involves two unique yet connected processes. The first is the great work of the external means of thinking, such as speech, counting, and writing. The second involves learning to use these symbols to understand and regulate one's thinking.

The ways that primitive mental functions undergo the lengthy transformation into cognitively based thought processes were described by two key principles.

- One is the general law of genetic development. All complex/higher functions began as social interactions between individuals and gradually acquire meaning and are internalized by the learner. In other words, relations between the complex/higher mental functions were at real relations among people.

- The second principle describes the process whereby speech and other artificial symbols are first controlled as a form of communication and then become instrumental in structuring and managing the child's thinking. The lengthy process of learning to use artificial symbols to structure one's thinking begins with learning to use auxiliary stimuli to mediate one's memory. Gradually, over an extended period of time, the individual acquires the capability to construct symbols to aid in thinking.

The development of human speech, Vygotsky noted, is a lengthy process with several stages that are similar to the stages in learning to use other signs. Development is a series of qualitative transformations. Each stage is a complex disintegration and reintegration in the form of a particular organization of psychological activity.

Both Piaget and Vygotsky considered the acquisition of speech to be a major activity in cognitive development. They differ in their view of the child's egocentric speech. For Piaget, egocentric speech is a characteristic of preoperational thinking, and this form of speech disappears as the child moves into concrete operations.

In contrast, Vygotsky views egocentric speech as an important transitional stage between external and inner speech. It is a significant phase in the child's learning to solve problems and to manage his or her cognitive activity. Thus, egocentric speech is a transitional stage between social speech and conceptual problem solving.

2.2.1 Social constructivist environment in education

To develop environment in education, neither Piaget nor Vygotsky developed explicit principles of instruction. Although both theorists commented on certain aspects of the teaching process, instructional principles may be inferred only indirectly from their writings. Piaget emphasized the growth of logical thinking as the goal of cognitive development. Vygotsky, in contrast, suggested the transformation of simple perception, involuntary attention, and simple memory into categorical perception, conceptual thinking, logical memory, and self-regulated attention.

In Vygotsky's perspective, joining problem solving occurs between partners, whereas in Piaget's view, individuals work with independence and equality on each other's ideas. Piaget's theory describes the independent learning of the individual, and Vygotsky's theory describes the learning that takes place from social interaction.

From Vygotsky's theory, there are two basic assumptions related to instruction, which can be inferred.

2.2.1.1 Social relation in the culture determines the individual's psychological structure. That is, the child learns to think in ways that are directly fostered and developed by his or her particular culture. (Individual cognitive development)

2.2.1.2 Instruction should be well planned and thereby maximally influence development. That is, the tasks that the child can complete in collaboration today, he or she can accomplish alone tomorrow.(concept of Zone of Proximal Development, ZPD) This process is for schools to create the courses that can develop the child's learning formation by concerning with the interaction with others the emergence of the use of symbols systems to control and direct one's own behavior (cognitive development by social interaction). The method for achieving those outcomes is "scaffolding".

. One of the most applicable theories proposed by Vygotsky is the Zone of Proximal Development (ZPD). The Zone of Proximal Development is defined by Vygotsky as the:

> "..the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers (Vygotsky, 1978, p. 86, [1])"

From a Vygotskian perspective, The learner's role is to bring what they already know into relationship with new information through interaction with others. The learner learns to think in ways that are directly fostered and developed by his or her particular culture. The responsibility of the teacher is to facilitate the students' learning process and to co-ordinate the learning with others around a particular

content. Instruction should be well planned and thereby maximally influence development. Thus, the important qualities of applied ZPD depend on well-trained teachers to structure the task so that the child may exercise his/her developing capabilities. The significant issue in developing higher mental functions is that instruction should proceed, whenever possible, in the child's zone of proximal development. Learning should be structured collaboratively in such a way that the teacher completes difficult aspects of the task until the child is able to master them. As the child gains proficiency, task demands are raised until the child functions independently and the teacher functions as supportive observer. (Gredler, 1997).

The zone of proximal development recently has received a great deal of attention in the United States (Wertsch, 1992). Since ZPD was pointed that the learner has greater potential when developing in collaboration with others or when supported by competent facilitators. It can operate only when interacting with people in one's environment and cooperating with one's peers. Vygotsky states that individuals can perform better when cooperating with more able peers. Thus, a significant guidance is believed to be needed for one's development within the ZPD and is known as scaffolding.

The term scaffolding, introduced by Wood, Bruner, and Ross (1976), describes the role of a tutor in enabling a child or novice to solve a problem that is beyond his individual efforts. The term appears to refer to the same processes that should occur in the zone of proximal development during instruction. In summary, scaffolding is the process of controlling the task elements that initially are beyond the learner's capacity, so that the learner can concentrate on and complete those elements within his or her immediate capability.

Scaffolding is also similar to the concept of shaping in that both reduce error and failure experiences in the early stages of learning as well as providing the decreasing level of support essential for complex performance. Praise and specific feedback related to the student's actions are important. The instruction in the zone of proximal development should begin as a shared activity between teacher and student. The teacher gradually transfers control to the student as he or she begins to master different aspects of the task, modify the activities. As students become more capable at the present task, the teacher increases her demands accordingly. In this way, student behavior begins to match that of the model, and the teacher's participation decreases to that of a supportive listener.

In summary, Social constructivist environment in education to facilitate complex mental functions requires structuring tasks and the providing of responsibility with care. Students have to develop their own cognition by social interaction.

2.3 Online learning to promote social constructivist learning environment

Lave and Wenger (1991) as well as Rogoff, (1990). extended the understanding of the learning environments of Piaget and Vygotsky. As mentioned before that neither Piaget nor Vygotsky developed explicit principles of instruction. The understanding of these theories helps develop the overview of the cognitive processes of learners, which can be extended and applied. For social constructivism, learning whether it is in a traditional classroom or online learning environment will be successful when it facilitates and nourishes social interaction among a group of learners.

Online course was created in this study, since now the online learning has been increasing its role. The opportunities for online learning increase daily. Students can attend a course at anytime, from anywhere. It enables student-centered teaching approaches. In an online environment, attendance to class is only evident if the student actually participates in online discussion. This increases student interaction and the diversity of opinion, because everyone gets a chance to contribute, not just the most talkative. It also facilitates team learning by providing forums for meetings and joint work. Computer technology is a cultural tool that students can use to mediate and internalize their learning. Research of Crawford (1996) suggests changing the learning contexts with technology is a powerful learning activity.

In an online course, based on social constructivist learning theory, with instant access to vast resources of data and information, students are no longer totally dependent on faculty for knowledge. They can develop their own cognition but the higher cognitive or complex development will be achieved if they learn with social interaction.For online environment, learning is becoming more collaborative, contextual and active. Instructors take the role of facilitators of information while guiding students toward solutions. In order for online learning to be successful, teachers as well as learners must take on new roles in the teaching-learning

relationship, and instructors must be willing to release control of learning to the students.

Later, Savery & Duffy (1995) described four principles that should be applied to modern technology-based learning environments based on constructivist views. These principles are presented below. (Harper, 1997):

1 Learning is an active and engaged process. "learners are actively engaged in working at tasks and activities that are authentic to the environment in which they would be used." (Savery & Duffy, 1995, p.37).
2 Learning is a process of constructing knowledge.
3 Learners function at a metacognitive level. Learning is focused on thinking skills rather than working on the "right answer the teacher wants". Students generate their own strategies for defining the problem and working out a solution. Student can gain wisdom through reflection.
4 Learning involves "social negotiation". Students are able to challenge their thoughts, beliefs, perceptions and existing knowledge by collaborating with other students thus assisting their cognitive development process.

To achieve online social constructivist learning development

To achieve online social constructivist learning development, there are two factors to be concerned. Those are appropriate activities or tasks and facilitators who understand their new roles.

2.3.1 Appropriate activities or tasks

There are many instructional activities available for use in the online learning environment, discussion forum for collaborative learning. Educators should choose instructional activities that are most effective for accomplishing a particular educational objective. From this perspective, instructional activities are tools available for educators for designing and facilitating learning. Below are two main instructional activities, which have been effectively used in the online learning environment. Those were individual activities and interaction activities.

2.3.1.1 Individual activities:

Web supported reading

An advantage of the online learning environment over the traditional FTF classroom is the many additional teaching tools available. Many of these tools can be used as information resource. (Clark, 2000) Students were motivated to learn depended as much on the context of learning as it did on intrinsic interest of the study. Students became immersed in as authentic experience as possible and this context provided the stimulus for learning. (Harper, 1997) The traditional format course reading (eg. lectures) could be presented on the web and the belief that learning does not deal with only academic subjects should be considered.

Quizzes

This activity was the auto-correct question types, including, multiple choice. It was delivered two times in the same unit of content (that students did each quiz before and after reading assignment was expected). This type of online activity was applied very productively to monitor students' own progress. It was automatically marked and recorded. The use of questions before, during or after instruction has been shown to increase the degree of learning (Ausubel, Novak, & Hanesian, 1978)

Concept mapping

One particular powerful approach to enabling knowledge involved was making connections between concepts. Individual concept map was to promote reflection upon understanding of each content. Concept map was created by using keywords that are representative of a specific concept. The information collected in the map is easily accessed by looking at how the relationships between words or concepts have been outlined. The main objective of this activity was to improve the organization of the recorded knowledge so that students easily retrieved what information they gained. Concept map has been used by students to reach a better understanding of certain information. Many literatures support the benefits of concept mapping. (Cicognani, 2000; Gunawardena et al., 2006; Hsu, 2004)

Authentic experiences Exploring real world situation:

Successful learning was promoted when it occurred with authentic activities. Learners are actively engaged in working at tasks and activities that are authentic to the environment in which they would be used. (Gunawardena et al., 2006; Harper, 1997; Jonassen, Strobel, & Gottdenker, 2005)

2.3.1.2 Interaction activities

Think aloud

Strategy for teaching 'thinking', Bloom and Broder (1950) asked some students to think aloud while others were asked to compare their own thought processes with those used by the first group of students. This was to practice successful thinking procedures. Thinking aloud has often been applied in training students' thinking (Bloom & Broder, 1950; McKeachie, 1999)

Think aloud in the study of Theeraroungchaisri (2004) was designed as an activity which students posted their thought or their experiences on the web to exchange and correspond with other students. It was required that before posting students had to categorize their thoughts into:

1) I learned meaning that the student got new knowledge,
2) I wondered meaning that the student was in doubt and wanted to find what it was,
3) I was surprised meaning that student was surprised about the new knowledge he/she gained that was different from the old one,
4) Aha! meaning that the student found the unexpected knowledge,
5) I would study meaning that the topic was interesting and he/she would like to search or study more,
6) I knew meaning that the student knew the answer for their friends' questions and wanted to share or exchange with his/her friends.

This activity gave students a chance to share their knowledge, ask questions and exchange ideas with friends. (Theeraroungchaisri, Sakulbumrungsil, Sthapornanon, & Watcharadamrongkun, 2004)

Reflective thought

Discussions are superior to lectures in improving thinking. Intrinsic motivation for thinking is considered as the important factor for developing thought. Wong and colleagues (1995) have recently begun to identify a range of critical thinking skills, associated with reflection. Reflective thought was another interaction activity, which students thought reflectively and systemically, then wrote a page-length essay and posted it on the web. In Theeraroungchaisri, et.al study (2004) he designed the reflective thought as to do own initiative reflective thought, each student had to feedback at least one of their friends' thought. Finally the owner of the thought that was commented had to response to friends' comments This provides a way for participants to examine the development of their own thinking and learning processes. (Morrison,2004))

Collaborative or Group working activity

Collaborative activity is the instructional use of small groups so that students work together to achieve shared goals. (Kanyongo, 2005) Collaborative activity was designed so that students, as a group, worked on an assignment by discussion. Discussion is the instructional strategy most favored by adult learners because it is interactive and encourages active, participatory learning. The discussion format encourages learners to analyze alternative ways of thinking and acting and assists learners in exploring their own experiences so they can become better critical thinkers. The discussion is often the heart of an online course. The Internet offers several modes for discussion including online conferencing programs, which utilized asynchronous communication. Synchronous (real time) communication can be offered by utilizing chat rooms or text-based virtual reality environments. By supporting synchronous or asynchronous group working modes, and by appropriate choice of design to support collaborative activity, it becomes possible for learners to work in teams and to acquire higher order learning skills from each other. (Morrison,2004)

In small groups learners can discuss content, share ideas, and solve problems. They present their own ideas as well as consider ideas put forth by others. In this way, they can be exposed to a variety of viewpoints on a given subject. There are many small group formats that encourage and provide opportunities for interaction. The discussion group allows learners to reflect on a subject under

discussion and present their views. Discussion within the small group is often on high intellectual levels - specifically analysis, synthesis, and evaluation. (Justus, 2005)

The benefit of online environments for group work is that they equalize control among participants. Many factors such as geography and gender do not disadvantage learners in this environment. Finally, the instructor is able to respond directly to questions and needs of particular groups without taking the time of other groups.

Problem Based Learning

Problem Based Learning is considered as one strategy to activate social constructivist environment and several researches show that problem based learning is particularly useful for teaching 'thinking'. (Chenga, Alafrisb, Kirschenbaumc, Kalisd , & Browne., 2003; Harland, 2003; McKeachie, 1999). Problem-based learning has been raised to motivate learners and generate high quality learning outcomes. Thinking, like other skills, requires practice. In practicing, thought should be challenged, corrected, or encouraged. Thus instructors need to give students opportunities to talk, write, do laboratory or field projects, or carry out other activities that stimulate and reveal their thinking. A developing thinker needs practice with various problems. Problem Based Learning is considered as one strategy to achieve practicing thought. The problem based learning can promote deeper cognitive engagement. In this study, the real life problems of community pharmacy were referred since these could motivate students to generally approach learning in a deeper manner, facilitating collaborative working.

Problem based learning can be achieved by the preparation of problems' design, decision or construction and is characteristically based on highly specified, given resources such as case studies. The students are required to analyze content, and formulate plans or solutions according to specified methods. The good problem to be modeled should be opened or ill structured which there is not a 'single' correct or 'best' result. Consequently problem based learning will be able to encourage students to apply their knowledge more deeply where the subject matter has not been directly covered in lectures. Currently, this form of learning is still limited. Knowledge building occurs in a problem based learning environment geared to questioning and innovation. Methods used to present the problem are practicable by

writing, role play to demonstrate a problem situation, games and simulations. Whatever the method used, the time should be allowed students to ask questions about the process they are to use and to clarify the nature of the problem presented. Appropriation is necessary for cognitive development in the problem based learning strategy within the zone of proximal development. Individuals participating in peer collaboration or guided teacher instruction must share the same focus in creating a process of cognitive, social, and emotional interchange. Furthermore, it is essential that partners should be on different developmental levels and the higher level partner should be aware of lower level (Driscoll, 1994; Hausfather, 1996). The two way communication becomes an instructional strategy by encouraging students to go beyond answering questions and engage in the discourse. This strategy involves the teacher and students exploring problems and then sharing their different problem solving strategies in an open dialogue. In harmonization with the zone of proximal development mentioned by Vygotsky, problems at first are relatively simple but become more and more difficult as student becomes more expert. Problems should deal with different content, applications and situations. This trend is to give students opportunities to talk, write, do laboratory or field projects, or carry out other authentic activities that stimulate and reveal interactions and ideas sharing.

After problem based learning, students should perceive that there are also other ways of seeing things besides their own perspective, and accept that all kind of knowing can help them to know the world and themselves more effectively. (Savin-Baden, 2000).

A good selection of online learning activities can minimize learning difficulties and maximize learning performance. (L.Chang & Kathryn, 2006; Schellens, van Keer, Valcke, & de Wever, 2007)

2.3.2 Facilitators understand their new roles

The instructor is one important factor to make online course success. Swan (2001) cited an instructor that interacts frequently and productively with students as one of three factors which contribute significantly to the success of asynchronous online courses. (Swan, 2001) In addition, qualitative data from Maor's study (2003) illustrated that affective support from facilitator became a critical motivating factor for learners when they were working in their new learning environment (Maor, 2003). Teaching involves preparation, instruction and assessment; but to be effective it also

involves the ongoing co-construction of each student's ZPD and the judgments about how best to facilitate his or her learning in the specific activity that he or she is engaged. (Wells, 1999) The roles of the instructor were acted as both instructor and online facilitator. Mainly instructor facilitated the students' learning process and constructed the online learning environment. Motivating students to participate online to share their experience and knowledge. Maintain a friendly positive tone, adding humor to the online class helped to relax students and make them feel more comfortable. Adding that level of comfort helped students feel more at ease with asking questions, communicating to the instructor, chatting with other students, and working in group with others. For student benefit, facilitators need to be both mindful of information overload, keeping activities to a manageable level and constantly recognizing the importance of affective support as part of creating community of learners. (Bowman, 2001; Maor, 2003; Moshinskie)

Instructors provided immense freedom to the students in initiating and supporting as many discussion threads as they deemed appropriate and necessary, the minimum requirement for web postings that students had to write on the web was designated. Practice sessions should be provided to help students become familiar with the technology prior to the actual tasks. They should prepare each unit of study content according to a standardized format and support facilities or technology as necessary. (Bowman, 2001)

2.4 Evaluation in online education

Generally, the evaluation procedure can be separated into two types; formative and summative evaluation. Jonassen (1991)stated that it is the process of knowledge acquisition, which should be evaluated, not any product or observable behavior. According to Jonassen, evaluating how learners go about constructing their knowledge is more important than the resulting product, suggesting that evaluative procedures must become a part of the instructional process. A combination of all these approaches would be the most useful for application in the social constructivist learning evaluation. The Formative and summative evaluation are reviewed as follows.

2.4.1 Formative evaluation

Having a formative type of evaluation supports the progression of learning providing immediate feedback and encourages self-reflection.

Currently, technologies are also available for incorporating continuous, dynamic assessment into learning materials (Lajoie, 1992). Assessment can be integrated into meaningful learning experiences. The work products; critique and discuss products grounded in authentic contexts, including portfolios, projects and performances can be apply more direct as the traditional measures of knowledge acquisition and understanding (Brent Wilson, 1995). To evaluate processes as well as products, a number of strategies for reflecting on process, for example; debriefings, interviews, group discussions, knowledge telling and process of problem-solving activities (Brown, 1989; Collins A. & S., 1987)

Bednar, et al (1991) defined two ways which social constructivist learning can be evaluated. They suggested that one method would evaluate how well students were able to function within a content, and whether they could use the understandings of the content to solve problems. The second method suggested was to have students reflect on the processes whereby they came to their conclusions and document this process.

These following are the examples of how to evaluate the online course formatively

2.4.1.1 Analysis of online interaction by discourse analysis; Content Analysis

Cook (2005) proposed that educational research on interactions has tended to focus on an analysis that is valuable for constructing or designing the learning environment The analysis of online interaction is especially valuable procedure, since it allows a direct observation of users' strategies (Rouet & Passerault, 1999). However, how to select and analyze appropriate method for user-system interaction is a problem of online learning course. One strategy that has been done by many researchers with various focuses is discourse analysis; content analysis.

The study of discourse processes can give an idea of cognitive activity more than measuring only the activity outcomes (e.g., the individual's performance on a posttest). The role of dialogue in computer-based learning is easy to investigate. Dialogue analysis has been done in order to examine students' interactions and thought formation. For the content analysis of the forums writing, it can provide a description of the comprehension processes and strategies.

The quality of student discussion and depth of cognitive processing are more considered. For example; Zhu (1998) analyzed the forms of online interaction and discourse (i.e., discussion, information sharing, reflection) the forms of student participation (i.e., seeker, mentor, or contributor), and the direction of participant interactions (i.e., vertical or horizontal) (Wang, 2001). Moreover, she also developed a model for the patterns of knowledge construction in student online discussion. In this model, Zhu begins to illustrate how new approaches, knowledge, perspectives, and understandings result from instructional scaffolding within students' zone of proximal development (Kuhlthau, 1996).

Henri (1992) was a pioneer in the development of criteria for content analysis who developed a useful tool for online discussion analysis He developed the criteria to assess the cognitive skills. It composed of 5 criteria; "elementary clarification", "in-depth clarification", "strategies", "inference" and "judgment". It is interesting that Henri's suggestions are similar to Benjamin Bloom's (1956) Taxonomy of Educational Objectives for the cognitive domain Bloom's taxonomy for the cognitive domain describes progressively higher levels of cognitive activity from

realistic information at the knowledge level to judgment and rating of information at the evaluation level. The similar aspect is presented in the Table2.3

Table 2.3 Compared Bloom's taxonomy for the cognitive domain and Henri's criteria for the evaluation of online discourse.

Bloom's taxonomy for the cognitive domain	**Henri's criteria**
Bloom's knowledge level,	Elementary clarification
Bloom's comprehension level,	"in-depth clarification"
Bloom's application level,	"strategies"
Bloom's "analysis" level	-
Bloom's synthesis level,	inference"
Bloom's evaluation level.	"judgment"
Hierarchical step	Not necessarily hierarchical step
	identified the level of information processing, (surface or in-depth processing,)

The weakness of Henri's criteria is that it lacks of complete criteria for systematic and strong classification of online discourse (Howell-Richardson & Mellar, 1996).

Noriko Hara et.al. (2000) identified cognitive skills embedded in student online discussions and modified the evaluation criteria from Henri's study (Bernard & de Rubalcava, 2000) (Table 2.4) Not only did students share knowledge during the online discussion, but content analyses by these criteria can indicate that students were processing course information at a high cognitive level. Content analysis is a key in understanding the dynamics of an online discussion. However, there were two serious problems presented in the report of Hara et.al. (2000) (Bernard & de Rubalcava, 2000). First, analyses of online discussions require extensive plenty of time to complete and fully comprehend. The other is that online discussion should not have unique direction.

The weakness of overall discourse analysis or content analysis is the validity and limits of verbal protocols, especially in the area of problem solving (Nisbett & Wilson, 1977; Rouet & Passerault, 1999; White, 1980). However, content analysis has been widespread applied in the online systems (Bernard & de Rubalcava, 2000; Mowrer, 1996).

Table 2.5 presents the examples of the qualitative questions when researchers tried to measure how interaction occurred during the online course. The unit of analysis used in those studies were various e.g.; meaning/idea, message posted. Some methods had inter-coder available. (Blinded /un-blinded) (Ahern T.C., Peck K. , & M., 1992; Campos, 2004; Mowrer, 1996). Semi-structure interviews, survey, content analysis were frequently applied (Campos, 2004; D.R., 1995; Kanuka & Anderson, 1998).

Table 2.4 The Henri's criteria modified/adapted by Hara et.al. to evaluate reasoning/ cognitive skills.

Reasoning skills	**Definitions**	**Indicators**
Elementary clarification	Observing or studying a problem, identifying its elements, and observing their linkages in order to come to a basic understanding.	Identifying relevant elements Reformulating the problem Asking a relevant question Identifying previously stated hypotheses Simply describing the subject matter
In-depth clarification	Analyzing and understanding a problem to come to an understanding which sheds light on the values, beliefs, and assumptions which underlie the statement of the problem	Defining the terms Identifying assumptions Establishing referential criteria Seeking out specialized information Summarizing
Inferencing	Induction and deduction, admitting or proposing an idea on the basis of its link with propositions already admitted as true	Drawing conclusions Making generalizations Formulating a proposition which proceeds from previous statements
Judgment	Making decisions, statements, appreciations, evaluations and criticisms	Judging the relevance of solutions Making value judgments Judging inferences "I agree, disagree . . . "
Application of strategies	Proposing co-ordinated actions for the application of a solution, or following through on a choice or a decision	Making decisions, statements, appreciations, evaluations and criticisms

Table 2.5 Researches evaluated how interaction occurred during the online course.

Researcher	year	Type of question
Mason	1992	Student initiate new idea? Instructor control, or direct? (Campos, 2004)
Ahern et.al.	1992	Question only, statement only, or conversational (Ahern T.C. et al., 1992).
Henri F	1992	Paricipative,social interaction, cognitive,metacognitive (Campos, 2004).
Anderson et.al.	1995	Critical thinking (D.R., 1995)
Newman DR.	1995	Critical thinking (Campos, 2004)
Howell-Richardson et.al	1996	The length and distribution of messages/ interaction analysis (Howell-Richardson & Mellar, 1996).
Mowrer DE.	1996	Computer usage data and transcriptions14 categories (service learning, student satisfaction, helpful activities, student suggestions, student complaints, good communication, questions to instructor, questions to peers, class structure, helpful hints, encouraging comments, learning advancement, miscellaneous comments, grade assessment) (Mowrer, 1996).
Gunawardena CN.	1997	The social construction of knowledge and collaborative learning five phase evolution of negotiation leading to the co-construction of knowledge: sharing and comparing information, the discovery and exploration of dissonance or inconsistency among ideals, concepts or statements, negotiation of meaning and construction of knowledge, testing and modification of proposed synthesis or co-construction, and agreement statement and applications of newly constructed meaning. Each phase is further subcategorized (Campos, 2004).
Marttunen M	1997	Argumentation. First, argumentation and counter-argumentation were identified and analyzed. Second, only counter-argumentation was analyzed. In addition, messages were classified according to a three level scale: good, moderate, and poor argumentation. (Campos, 2004).
Bullen M	1998	Critical and uncritical thinking skills three level scale of critical thinking was used to classify results: extensive, moderate and minimum use of critical thinking. (Bullen, 1998).
Kanuka H	1998	Interactions (Kanuka & Anderson, 1998).
Fahy PJ	2000	Assess computer-mediated communication interaction as well as knowledge construction. Defines postings vertical or horizontal ;critical thinking and participation; classifies discourse according to : vertical questioning, horizontal questioning, statements, reflections, and scaffolding. (Fahy P.J. et al., 2000).

2.4.1.2 Analysis of the time spent online

Reading time analysis is the examples of evaluation techniques. Reading time analysis is for assessing the process of the online learning or the discourse comprehensive The limitation of this method is that the amount of time spent on a given part may not exactly reflect cognitive processes in that part. Reading time is sensitive to numerous linguistic and contextual variables.

2.4.1.3 Students perception of the online process of learning

Instructional designers should have different types of skills to create the open-ended problems, a questionnaire survey that can motivate learners to discuss or make decision; consequently the learners can share information together to achieve critical thought.

2.4.1.4 Social constructivist online learning environment evaluation

The significance of web based university or distance teaching and learning from a social constructivist perspective is discussed in various researches (Jonassen, 1996; Owston, 1997). The new technology of the Web offers inimitable advantage for promoting a reflective and collaborative learning environment (Bates, 1997). In designed online instruction, students would have the opportunity to establish communicative relationships with each other and to reflectively co-construct their knowledge by engaging in open and critical discourse (Maor, 1998; Taylor, 1999).

To figure out how students perceive the online classroom environment Peter Taylor and Dorit Maor (2000) developed the Constructivist On-Line Learning Environment Survey (COLLES) as a measurement tool (Peter Taylor & Maor, 2000). The COLLES is composed of 6 scales linked to learning environment from the theory of social constructivism which is guiding leading edge research on the role of students' predispositions in shaping the quality of their discourse in Web based teaching and learning. The scales are concerned with students' perceptions of the existence of an online environment that supports them to reconstruct themselves as both reflective and collaborative learners. The COLLES is to measure students' (and tutors') perceptions of:

1. Professional Relevance - the extent to which engagement in the on-line classroom environment is relevant to students' professional worldviews and related practices.
2. Reflective Thinking - the extent to which critical reflective thinking is occurring in association with online peer discussion.
3. Interactivity - the extent to which communicative interactivity is occurring on-line between students and between students and tutors.
4. Cognitive Demand - the extent to which challenges and communicative role modeling is provided by tutors.
5. Affective Support - the extent to which sensitive and encouraging support is provided by tutors.
6. Interpretation of Meaning - the extent to which students and tutors co-construct meaning in a congruent and connected manner.

A second form of the COLLES contains parallel items designed to obtain measures of students' (and tutors') expressed preferences for the above aspects of the online learning environment. By administering both forms of the COLLES at the end of a period of innovative course, a result will present the students' satisfaction of the course. There are many research applied COLLES as a tool to assess social constructivist environment in an online course. (Kevin Johnson, Cathal McHugo, & Hall, 2006; Peter Taylor & Maor, 2000; Sibbald, 2003)

2.4.2 Summative evaluation

Summative evaluation does not consider about the idea of growth throughout the learning process, and focuses only on a final evaluation at the end result and bypasses the entire learning process. In traditional way of learning evaluation, the learning performance is one variable to evaluate the outcomes of the learning strategy. Performance is expressed as learning outcomes; knowledge. (Donna Rogers, Joan Thomson, Craig Bernecker, James Flemming, & Goepp, 2005) Students' performance can be specified what learners will know or be able to do as a result of a learning activity. Barnett (1994) suggested that an educational goal should be the development in a form of deep reflection and collective exchange. Indeed there is sound empirical evidence that good knowledge and good thinking are linked together (Barnett, 1994). In this study, both immediate and retained learning achievement (knowledge) from social interaction are considered as one component of the students' performance.

In summary to evaluate online course, online parameters are not to be used in isolation. Rather, it is wise to use a combination of parameters, especially when studying complex cognitive activities. In addition, the use of online parameters should link together with the importance of assessing the outcomes of the subject activity. For instance, if the purpose of the task is to acquire knowledge, then knowledge acquisitions should be assessed through appropriate post-tests as well (Rouet & Passerault, 1999). Then to better understand the impact of online instructional course the content analysis of the discourse/discussion forum as qualitative research suggestions were offered as well as the posttest to quantitatively monitor how other variables change after the course.

2.5 Related studies in the field of online learning

Literatures have been shown that majority of researches in an online education were descriptive rather than experimental. (Sadik, 2003) The aim of these studies was to apply features of the tools and the web in designing and developing future online education programs. (Allen, 2005; Colin, 2005; Schneider , Chakroun, Dillenbourg, & et.al., 2002; Stepich & Ertmer, 2003; Taylor & Hsueh, 2005; Wilcox & Wojnar, 2000)

Some researches evaluated online learning by using various dependent variables such as student academic performance (Cho, Gay, Davidson, & Ingraffea, 2007; Jung, Choi, Lim, & Leem, 2002; Schellens et al., 2007), the affective attitudes (Francescato et al., 2006; Gunawardena & Zittle, 1997; Jung et al., 2002; Quaintance, 2006; Saenz, 2002; Swan, 2001) Some of these researches have compared the results with traditional learning (Face to Face) (Francescato et al., 2006; Gagne & Shepherd, 2001; Spencer, 2002). It seems that the majority of researchers agreed that online instruction is at least as effective as traditional way of teaching.

There were some studies of the online environment focus on social interaction enhance learning outcomes (Castro, 2005; Chang, Cheng, Deng, & Chan, 2007; Cho et al., 2007; Graham & Scarborough, 2001; Gunawardena et al., 2006; Macdonald, 2001).

In Johnson- Taylor study, (Johnson-Taylor, 2005) they examined discussion in three instructional environments--fully asynchronous, blended, and face-to-face.

Students in asynchronous mode had to do more than just nod their heads in the traditional classroom. Socially, in the online learning medium, a lack of community and a lack helpful discussion does not appear to impede participation on the part of students as long as there is a minimum number of required postings.

There was a study by Schweizer, Paechter, & Weidenmann (2003) an empirical study was used to analyze how groups of learners work together in online learning and blended learning environments. The results showed that it was not always necessary for the members of a learning group to meet face-to-face. It was also shown that the efficiency of the cooperation between peers depended on the communication setting as well as on the type of tasks or strategies.

In summary, a review of the literatures showed that although an enormous number of studies were conducted in the area of online education but lacked of deeper studies that would provide more detail of the strategies or tasks to facilitate social constructivist learning environment especially studying in the form of experimental design. A number of studies investigated the effectiveness of online interaction, not the entire online learning environment. Even in those studies that investigated entire online environments, student achievement was the most common indicator for evaluation and no other indictors or factors (such as student satisfaction), which may influence students' achievement, were investigated to give more comprehensive understanding of the effectiveness of online education. (Sadik, 2003)

This study was conducted as a whole to discover the strategy to facilitate social constructivist learning environment and to measure the overall quality of student performances. In this study, student performances were not only the immediate learning achievement but retained as well. Moreover, the participation process was also considered. Conceptual framework was presented in Figure 2.1

2.6 Conceptual Framework

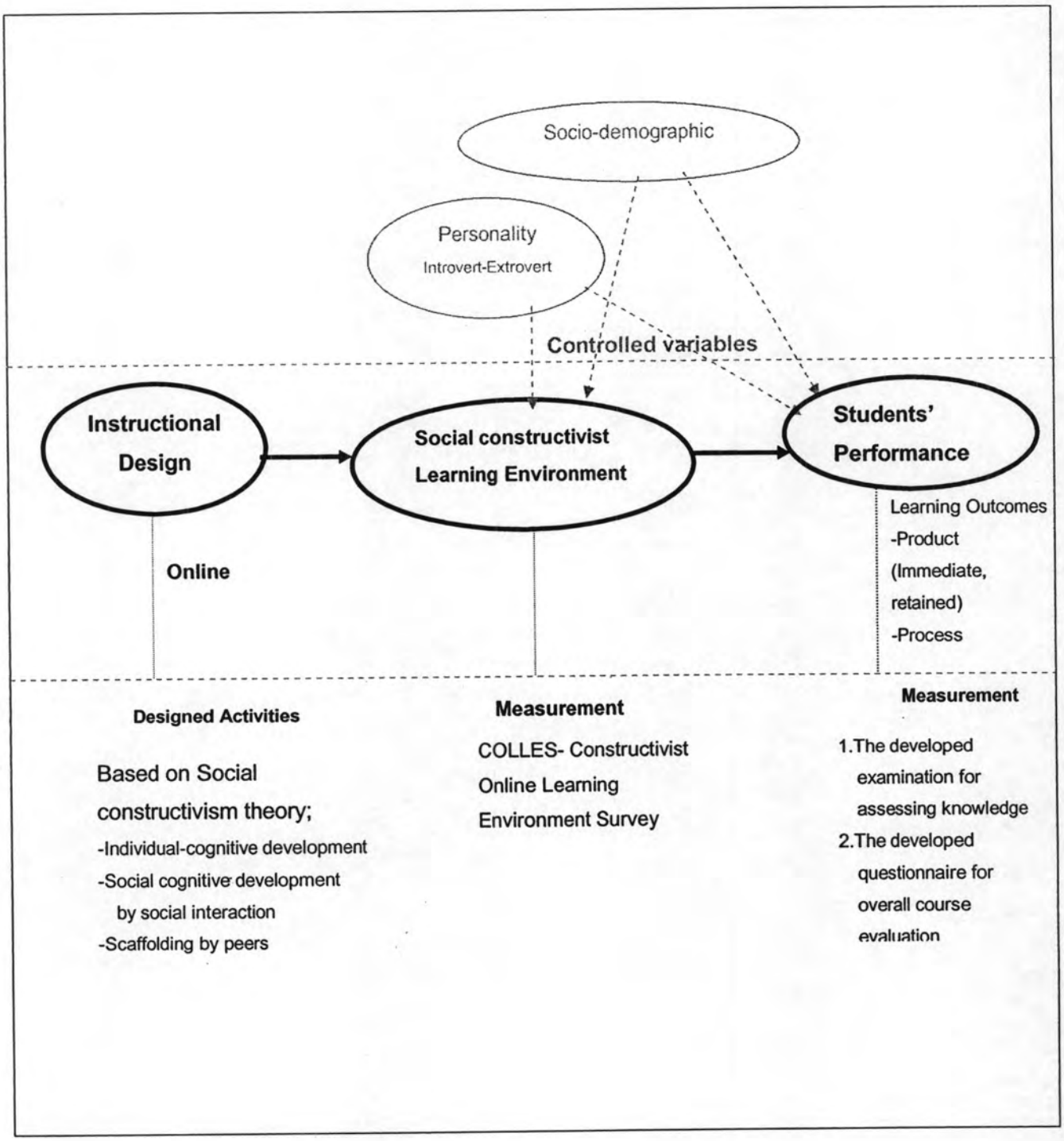

Figure 2.1 Conceptual Framework