

## Comparison of Instruction Approach of e-Learning with SWOT Strategy

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### Abstract

Although e-learning is popular today, it still needs more analysis to draw a better outline. In this paper we classified six phases which e-learning designers should consider while designing instruction. There are seventeen instruction approaches within these phases. They are (1) system phase : synchronous approach and asynchronous approach, (2) procedure phase : blended learning approach and pure on-line learning approach, (3) control phase : teacher-centered approach and student-centered approach, (4) communication phase : student to student approach, student to teacher approach and student to content approach, (5) media phase : text-based approach, video-based approach, multimedia approach and virtual reality approach, (6) pedagogy phase : expository approach, inquiry approach, simulation approach and adaptive approach. Regarding the above, the SWOT strategy was used to compare the effectiveness of instruction approaches among these phases. The results of this comparison research can be used as a reference for selecting and designing the most useful e-learning instruction strategy.

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### INTRODUCTION

E-learning has been widely utilized to distance learning system within many educational settings. As the particular system provides sufficient access and support, teachers will be better able to help their student acquire informational resources, and meet their students' individual needs. In this research, we clarify instructional approaches and compare them with SWOT strategy. Since SWOT (Strength, Weakness, Opportunities, Threats) strategy is frequently used in policy making for an institution and is recognized as an efficient method for system analysis, it may be helpful for analyzing the instructional approaches of an e-learning system. For the advent of the fast developed e-learning systems, many schools and training organizations try to find better fitted instruction methods to uplift their teaching performance. Among them, SWOT can be available for evaluating the whole system performance. It is expected that the instructors and trainers will understand the strength and weakness of each instructional approach taken by the e-learning system.

### SIX PHASES OF E-LEARNING INSTRUCTIONAL APPROACH

Up to the present, e-learning is deployed in many school systems. For the development of e-learning system, there are six phases which need to be considered. They are: (1) system phase: synchronous approach and asynchronous approach, (2) procedure

synchronous approach and asynchronous approach, (3) control phase : teacher-centered approach and student-centered approach, (4) communication phase : student to student approach, student to teacher approach and student to content approach, (5) media phase : text-based approach, video-based approach, multimedia approach and virtual reality approach, (6) pedagogy phase : expository approach, inquiry approach, simulation approach and adaptive approach.

SWOT is applied in this paper to analyze instructional strength and weakness among these six categories of e-learning phases. S and W focus on the superior and inferior character in learning effect. O is concerned about when to use it. T describes obstacles or disadvantages with implementation.

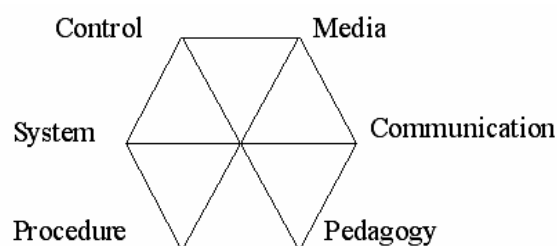


Figure 1 Six phases of e-learning instructional approach

## 1. System phase

There are “Synchronous and Asynchronous” approaches which a designer can take while designing the instructional plan. Also, the term of synchronous and asynchronous apply better to individual events and activities than to whole courses [1].

### 1-1. Synchronous approach

When learning subject requires real time discussion, synchronous instruction can be a better choice. Synchronous instructional events could be of a higher fidelity to users especially when learners are allowed to interact with instructor or other learners on line. It is better for courses to require extensive real time interaction and live human illustration in order to acquire the learning effect. The obstacle of promoting a synchronous e-learning system is that user interface is still not very adequate for all users simultaneously to participate in a large group class.

### 1-2. Asynchronous approach

As for learners who want to take a course in their available time, the asynchronous instruction approach is a good solution, but some learners tend to drop class for lacking of real time interaction.

## 2. Procedure phase

Blended learning and pure on-line learning are two alternatives in procedure phase. But more teachers

prefer the blended instruction method to enhance student’s learning attainments.

### 2-1. Blended learning approach

Owing to the lack of a human element in education, teachers are enrolled into the pure on-line e-learning procedure to improve the interactive relationship between instructors and learners. The teacher can contact students some time during the on-line study, and progressively interact with students for timely help. Thus, this blended instruction approach can improve the learner motivation. The teacher-student interaction can be arranged two or more times in a course session. In general, online teacher-student or face-to-face interaction, can be arranged in the beginning and the end of a course schedule, or meet in the middle of a semester to enforce the students’ motivation.

### 2-3. Pure on-line learning approach

Pure on-line learning approach is used due to long distance separation, and its effectiveness depends on the degree of learning motivation, because it is very hard to control or ensure student attendance and to give full attention to his needs, with a pure on-line system. For this reason, pure on-line learning requires an experienced e-learning instructor to constantly interact with students to maintain the learner’s attention.

Table 1. Comparison between Synchronous instruction and Asynchronous Instruction

System- phase	S	W	O	T
Synchronous	High fidelity to learners	Fixed learning schedule	Better for courses to require extensive real time interaction	User interface for a large group class is still not adequate
Asynchronous	Flexible learning schedule	No real time interaction	Suitable for most of the content area	Learner tends to drop class for lack of real time interaction

Table 2 Comparison between blended learning approach and pure on-line learning approach

Procedure-based	S	W	O	T
Blended learning	Face to face interaction can reduce drop out rate	Learning schedule become less flexible	Feasible way to deploy e-learning course	Need to consider reasonable travel time to attend classroom instruction.
Pure on-line learning	No distance limitation	Hard to ensure learner’s attendance and full attention	Better for learners with a more field independent personality	Requires an experienced e-learning instructor who can constantly interact with students to maintain the learner’s attention

### 3. Control phase

When considering the center of control while developing an e-learning course, two instructional approaches should be considered, which are, the Teacher-centered and Student-centered approaches as follows.

#### 3-1. Teacher-centered approach

A teacher-centered approach is more instructor-led in which teacher control the learning sequence, learning schedule and learning pace. Normally, teacher-centered instruction is more of a singular effort as the teacher takes most of the responsibility for delivering knowledge. Students can only follow what teacher offers. Teacher-centered approaches can be viewed as a one way communication oriented method in which the teacher plays the role of an information broadcaster, in which students have less chance to interact, also teachers' personality, presentation style, and appearance can all affect students' motivation. Thus, the learning effect depends largely on instructor's guidance.

#### 3-2. Student-centered approach

Contrary to the Teacher-centered approach is the student-centered instructional approach, which is a learner-led method. Students can have more freedom navigating learning content, selecting learning activities, managing a learning schedule and deciding learning sequence. They are more independent than the previous approach, while their learning is taking place. A web-based learning community is a good example of student-centered instructional approach. Since the learner has more control over his learning activities, the learning effect will largely depend on student's operation and involvement. When the instruction program is delivered, it could be at some point between these two extremes. It depends on the instructional approach designed.

### 4. Communication phase

According to the instructional design of an e-learning course, the communication process could be emphasized on one of the followings: student-to-student oriented, student-to-teacher oriented or student-to-content oriented.

#### 4-1. Student-to-student approach

Instructional design focused on student-to-student interaction tends to emphasize social relationships, which can promote collaboration with others. A student may become motivated by other students through discussion, corporation and sharing. And this approach can promote multiple viewpoints which will stimulate more reflection, and contribute to knowledge construction. But the difficulty of this approach is that it is very hard to control the quality of interaction and to evaluate the performance of

learners. Thus for the courses emphasized on learner-to-learner interaction such as small group discussion, case study, or project based learning, it is good for improving students' interactive ability and social adaptability. The quality of this interaction must have some agents to control.

#### 4-2. Student-to-teacher approach

For student-to-teacher interaction oriented courses, the learner is more like an apprentice to his coach, instructor, or mentor who gives regular feedback on learner's performance. Normally the learning effect of this approach largely depends on the profession and teaching quality of instructor, because learners must rely on instructor's professional feedback in order to make progress. Thus for advanced knowledge and skill, which is harder to attain through self-directed learning, like carpentry, beautician work etc., one can take the student-to-teacher interaction approach as the main process.

#### 4-3. Student-to-content approach

If e-learning instruction proceeds with the emphasis on student-to-content interaction, it is more self-directed and requires a higher quality of content presentation and better learner cognitive strategy. Thus a standardized content is required to make up instructor's performance reliability. Therefore, good design of instructional strategy, user interface, visual communication and multimedia are crucial for this approach.

### 5. Media phase

Instructional media can dramatically improve learners' motivation. We categorize four media approaches for developing an e-learning course. They are text based media, video based media, multimedia and virtual reality.

#### 5-1. Text based approach

Text based courses are mainly using text as the interaction protocol, such as email, electronic whiteboard discussions which are tools for text-based communication. Some course content is developed using text as the presentation tool, such as reading and writing courses in language, and mathematics learning.

#### 5-2. Video based approach

Video based e-learning instruction uses video as the main media representation for learning content. It is good for learning that requires specific demonstrations. As the streaming technology has been developed, many courses can be presented with video to show the instructor's speech and demonstrations. It provides similar environment as in the classroom. The flexibility of video player applications can be helpful for distance e-learning.

### 5-3. Multimedia based approach

Multimedia based web courses integrate text, sound, picture, animation and video to represent the content. It is the most popular media style for an e-learning course. Most of the learning content can be presented with multimedia system. The teaching effectiveness of this approach is better than the former approaches, but it needs to pay the price for development of available multimedia teaching material. A poorly designed multimedia content may distract the learner's attention from the desired educational effect of the media content.

### 5-4. Virtual Reality approach

Virtual reality, as a comprehensive product, combines the knowledge base, expert system, and human sensational psychology. VR is a technology which can simulate three dimensional environments and permit the participant to sense and interact with the virtual reality [2]. This approach can provide more

messages for human perception. For example, as an object is moving, the VR user may give response to his perception. Since the image broadcast on the screen is designed as if user is moving with the scene presented, it is characterized with immersing, imagination, and interaction.

Therefore, the VR approach can provide "like real" experience for learners [3]. It is especially good for presenting learning content which require three dimensional presentation for multiple perspectives, personal attending and manipulating. For example, the teaching content of a medical operation, interior design, visiting guide and operation in dangerous area, are suggested to apply Virtual Reality to ensure learning effect. But the high cost of equipment, time spent for developing the teaching material and high human resource capital for designing VR-based e-learning systems are necessary to overcome before implementing Virtual Reality e-learning approach.

Table 3 Comparison between Teacher-centered instruction approach and Student-centered instruction approach

User phase	S	W	O	T
Teacher Centered Approach	High learning efficiency	Lack of interaction	Better for novice learners or ABC stage training	Need more design to promote learner's motivation
Student Centered Approach	Flexibility in learning pace, schedule, and sequence	Hard to enforce learner study and practice	Better for learners equipped with previously acquired	Need more design on content organization to ensure all the learning path users choose will lead to intended learning objectives

Table 4 Comparison among courses focus on student to student, student to teacher, student to content interaction

Interaction phase	S	W	O	T
Student to student	More peer interaction can promote learning motivation	Hard to control the quality of interaction and evaluate the performance of learners	Small group discussion , case study, project based learning, and critique, are good ways to promote student to student interaction	Requiring platform with good quality and sufficient functionality
Student to teacher	More contact with experienced instructor can enhance learning	Hard to offer high quality interaction to each learner when there is a big class	Better for small size class and high motivation learners	Requires more effort for instructional design of coaching and mentoring
Student to content	Standardized content delivery without being worried about instructor's performance reliability	Lack of real personal interaction	Course can be deliver to large population without concern for instructors' teaching load	Requires good design in instructional strategy, user interface, visual communication and multimedia effect

Table 5 Comparison among text based media, video based media, multimedia-based and virtual reality based learning

Media phase	S	W	O	T
Text- based media	Easy to develop	Lack of visual attraction	Better for reading and writing courses or discussion oriented courses	Hard to compete with web courses which apply multimedia
Video-based media	Capable of real-event or scene presentation	Easy to be restricted to linear broadcasting	Good for learning which requires a real demonstration	Require a studio setting, more labor implement and development (actor, photographer, light man, director, etc.)
Multi-media based	Better audio-visual attraction	Bad design might distract learners from the desired effect of the media content	Good for most of the content	Instructional design is crucial to ensure learning effect
Virtual-Reality based	Provide “real” experience		Good for content that requires a 3D presentation from multiple perspectives	High cost to develop VR system

## 6. Pedagogy Phase

Concerning the pedagogy phase, we focus our discussion on instruction issues and categorize four instructional approaches that are: expository, inquiry, simulation and adaptive approaches.

### 6-1. Expository based approach

An expository based approach is more information disposition oriented. This kind of content presentation is based on the characteristics of particular knowledge discipline and target users' entry level[4]. A fixed structure of learning content make learners navigate within the node of this structure. All the content is passively presented as users navigate to that page. This approach lacks interaction, but may be easy to develop the teaching content. It will shorten the learning time. But, because this approach is somewhat like a teacher-centered approach, it still needs more audio and visual design to maintain user's motivation. There are three navigational styles in this approach such as lecture based navigation, linear navigation, and hierarchy based navigation as the following illustration.

#### a. Lecture based navigation

Lecture based navigation of e-learning system usually broadcast one way video of instructor's lecture, along with the outline corresponding to instructor's lecture to the distant learner. The learner can navigate through the lecture by clicking on the outline keywords and see the illustration board as well.

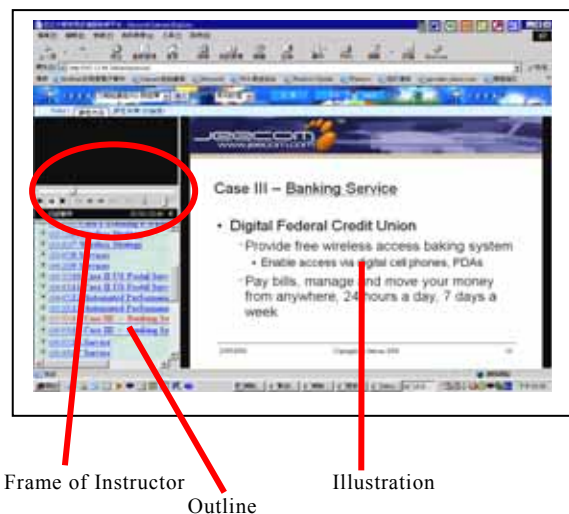
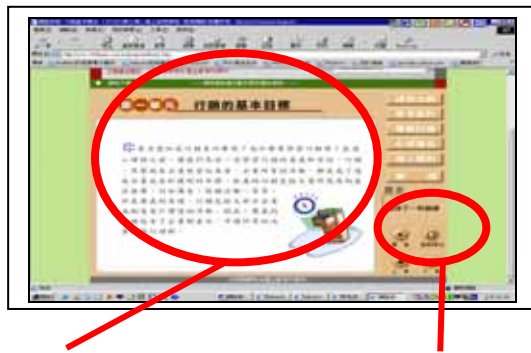


Figure 2 Lecture based e-learning instruction

(Source:<http://163.13.4/idea/classroom>)

#### b. Linear based navigation

Linear based navigation has more resemblance to traditional classroom instruction because its learning sequence is fixed. However, the capability of multimedia presentation, web page is superior to traditional instruction since it maintains better motivation.



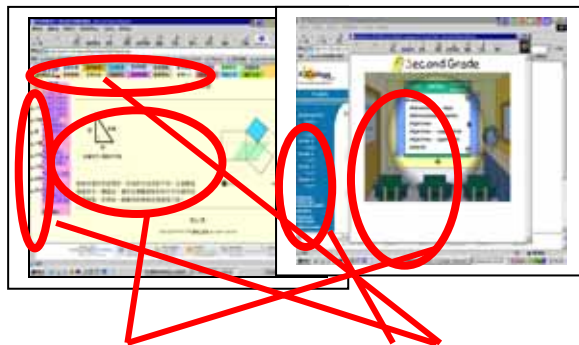
Content Buttons for linear structured content

Figure 3 Linear based navigation

(Source: <http://www.104learn.com.tw/104learn.htm>)

#### c. Hierarchy based navigation

Hierarchy based navigation style is popularly used in most e-learning courses. This style of learning is constructed with a basic hierarchy tree at bottom layer of the screen, and is accompanied with some other sub-frames on the screen. It is more user friendly in content navigation. The hierarchical structure for content presentation provides students more options to learn different kinds of knowledge.



Content corresponding to node clicked

Hierarchy structured tree

Figure 4 Hierarchy based navigation

(source : <http://netcity1.web.hinet.net>  
<http://www.k2college.com/UserData/lsc24285/default.htm/Webpages/English.asp> )

#### 6-2. Inquiry based approach

Inquiry based approach maintains learner's attention through a series of question. It always offers a well designed context with learning cues for timely help to maintain learning motivation. This kind of instruction focuses on the strategy of stirring learner's response to

improve how he will learn rather than what he will be taught. Consequently, the learning process of this approach may be more complicated and time consuming than other approaches. For deepening the knowledge depth, the inquiry technique must be carefully designed to guide the learners to reach his intended learning objectives. Inquiry approach of e-learning instruction is becoming more important for improving student's creativity. It can consist of discussion style and project based style as the following:

#### a. Discussion style

Discussion is a social interaction oriented instructional event. Learning takes places while discussion progresses. Learning community, discussion group, critique, case study, and problem based learning are good examples of utilizing discussion to learn. Since discussion is a good way to get multiple perspectives and feedback from others, it can help learner reflect on his own perception and improve cognitive operation due to idea sharing. Though discussion is a good way to attain and provoke multiple perspectives, discussion partners may be easy to deviate to irrelative points if instructor does not monitor the discussion process and make some timely interference when the discussion proceed away from the designed purpose. On the other hand, sometimes wandering discussion is good for producing creative thinking.



Figure 5 Discussion style of instruction

(Source: <http://community.aarp.org>)

#### b. Project based instruction style

Project based style of instruction requires learners to complete a mission or produce a product within a period of time. The instructor may provide related resources for students or just give them a topic to finish. Students involved in this instructional activity must have active motivation to finish their project.

As in the e-learning system, project based instruction can improve problem solving skill through learning community on the web site. Normally, the project assigned should not be so constrained that outcomes are predetermined. It is better to leave students with some opportunity to develop their own approaches to investigating and answering the initial question. Project based Instruction is a practical way of learning which is good for transferring knowledge or skill to real situations. But it may require more time in discussion with group member, than other styles, while working on the project.

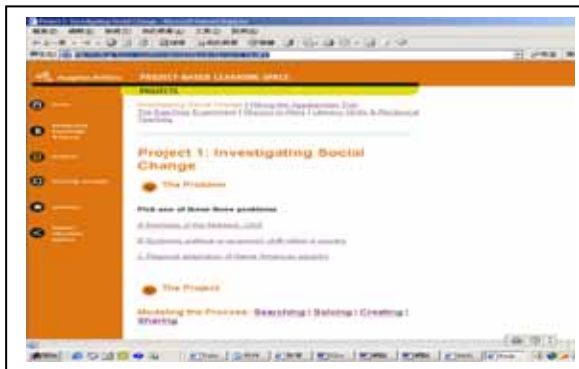


Figure 6 Project Based Instruction

(source:<http://college.hmco.com/education/pbl/project/project1.html#A>)

#### 6-3. Simulation based approach

Simulation is one of the most favored techniques to solve engineering problems. It can be used as a replacement for real role playing to show some phenomenon or activities that users can interact with. Users can learn through the interaction with the simulated model.[5] A simulation system integrated educational technology, entertainment design, ad-

vanced media technologies, and internet to provide similar a environment for learning as if in the realistic experiences. It can provide hands-on experience through operating a very sophisticated and highly designed pseudo system.

Since student's motivation about learning content always comes from real world experience, the best way to obtain knowledge and skill is to participate in real life activities. But, for some special experiences or high price work, simulation training may be helpful for repeatedly training in order to reduce the training costs.

The quality of a simulation based approach depends on the similarity of man-made environments to the real world situation. The knowledge retention and skill retention will be improved if the interaction between learner and the simulation system is accelerated through a well designed system. Most research has found particular value of a simulation based approach for special skill training.

#### 6-4. Adaptive based approach

An adaptive based approach is carried out through computer assisted adaptive tests. It is the most recognized adaptive learning system in recent decades. The adaptive test is developed based on "Item Response Theory" which will give students suitable learning material after checking their previous response. A well designed adaptive learning system can monitor the student's progress with a particular knowledge base and interpret their ability level after learning each unit. The real time feedback may provide adaptive guidance for student based on system response logic. Nowadays adaptability can be better incorporated into large online web systems through intelligent agents. It can also be applied to discovery-type, or constructive oriented learning to provide adaptive support.

Table 6 Comparison among instruction styles of Expository Approach

Instruction styles	S	W	O	T
Lecture based navigation	Similar to classroom instruction	Allow little opportunity for learner to develop deeper thinking	Lower cost and shorter producing time	Good quality of broad-band architecture and technology required
Linear navigation	Well planned learning sequence	No flexibility in learning sequence	Good for procedure knowledge, especially for novices	Need to put forth more effort to maintain learner's motivation
Hierarchy based navigation	More user friendly in content navigation. Clear presentation of content structure can be a good advance organizer.	Less effective for passive learners	Feasible for most knowledge content	Require more visual design to maintain motivation



Table 7 Comparison among instruction styles of Inquiry Approach

Instruction styles	S	W	O	T
Discussion	Provoke and attain multiple perspectives	Easy to deviate to unrelated points	Good for issues with no right answers	Require good strategy to encourage involvement
Project based Instruction	Practical way of learning which is good to transfer knowledge or skill to real situation	Require more discussion with teacher than other patterns	Good for problem solving learning	Hard to evaluate individual performance while assigned to group projects

Table 8 Comparison among Expository, Inquiry, simulation and adaptive approach

Instruction pattern	S	W	O	T
Expository approach	Higher learning efficiency	Lack of interaction	Most content can take this approach	Need more design to attain learner's motivation
Inquiry approach	More interaction between context and learner can help better transfer	Students have to spend more time to learn	Good to teach concept, procedure, principle and problem solving	Require good instructional design to keep the user going on appropriate path in order to reach intended learning objectives
Simulation approach	Good to enhance motivation and learning transference	Simulation will mislead user's cognition toward the reality if it is not precise enough	Good to learn procedure, principle and problem solving. Solution for learning content involving danger or damage	High cost to develop
Adaptive approach	Adaptive to learner competence	Hard to present knowledge to learners systematically	Solution for large amount of learners from various entry level	Requires a lot of samples, test items, and complicated statistical work to develop adaptive system

### SELECTION STRATEGY OF E-LEARNING INSTRUCTION APPROACH

An available e-learning system is based on the correct pedagogical concept, learning platform, and learning content management. It is superior to traditional teaching based on the fast interaction with knowledge base and distant learning. Students can enter the web site for learning from anywhere and at any time. But how to develop a successful e-learning instruction system and how to select a right approach for student learning becomes the key component of a superior teacher.

Based on the generally recognized instructional design model-ADDIE, we can understand that audience, content, objectives and resources should be assessed during analysis stage. Then the instruction approach which we discussed above can be

appropriately decided at the design stage following the analysis stage.

In this paper, instructional approach is a broader concept, compared with instructional strategy usually mentioned in the instructional design process. Instructional strategy is the deploying of a series of activities which could be as detailed as Gagne's 9 events, while instruction approach is considered from a higher level, which is a decision of an overall instruction inclination within an e-learning course.

In order to provide a better picture for the selection process, there is a matrix as shown in Table 9 that helps. Based on the results of audience analysis, resource analysis, content analysis, objective analysis and context design, the instructional designer can choose fitted instruction approaches accordingly. Sometimes the selection results may not be



unanimous in one specific phase, so this table can help the instruction designer and project manager clarify their priority of crucial points to make a final decision of each phase on the right column.

Based on the final decisions on the right column in Table 9, we can draw “A Cone of e-Learning Instruction Approach” which represents the instruction approaches taken for a specific e-learning course or curriculum. Each approach taken should be designed based on the approach below it in this cone as depicted in the Figure 7.

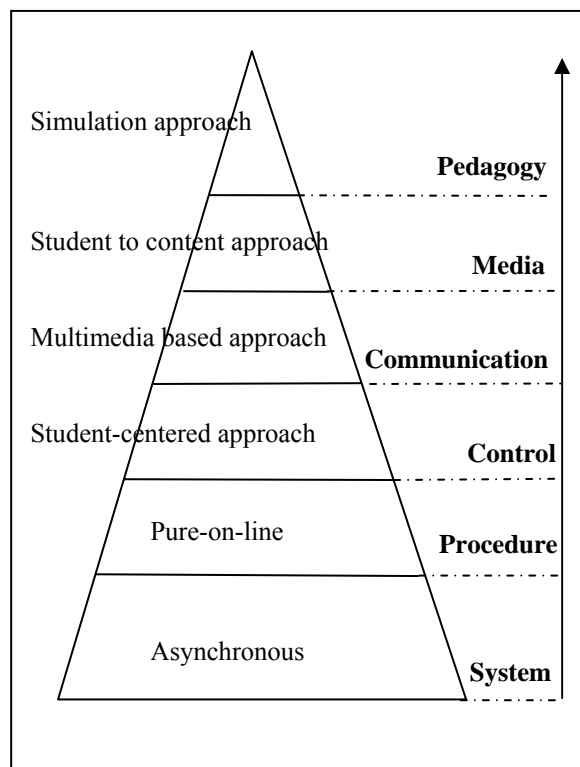


Figure 7 Cone of e-Learning instruction approach

## CONCLUSION

According to the SWOT analysis, as mentioned above, instructional approaches of e-learning can be versatile when encountering different knowledge fields, involving different levels of learning domains and meeting with divergent learners. The resources and degree of support within the educational setting should also be considered while developing e-learning system. No specific instruction approach can fulfill all requirements of all situations. Generally speaking, the expository approach is more appropriate for declarative knowledge learning, and

the inquiry approach is better for learning procedure domain knowledge. Both approaches are good for learning cognitive domain knowledge. The opportunity column may be the most helpful for developing or selecting a suitable e-learning instruction approach.

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Table 9 Selection Matrix of Instruction Approach

phase	concern approach		Audience Analysis	Resource (Technology) Analysis	Content (Task) Analysis	Objectives Analysis	Context Design	Decision
System	Synchronous			x				Asynchronous
	Asynchronous		x	x	x	x	x	
Procedure	Blended Learning Approach		x	x		x		Pure-on-line Learning Approach
	Pure-on-line Learning Approach			x	x		x	
Control	Teacher Centered Approach			x				Student Centered Approach
	Student Centered Approach		x	x	x	x	x	
Communication	Student to Student Approach			x				Student to Content Approach
	Student to Instructor Approach			x				
	Student to Content Approach		x	x	x	x	x	
Media	Text Based Approach			x				Multimedia Based Approach
	Video Based Approach			x				
	Multimedia Based Approach		x	x	x		x	
	Virtual Reality Based Approach						x	
Pedagogy	Expository Approach	Lecture Based Navigation		x				Simulation Approach
		Linear Based Navigation		x				
		Hierarchy Based Navigation		x	x	x	x	
	Inquiry Approach	Discussion Based Instruction		x				
		Project Based Instruction		x				
	Simulation Approach		x	x	x	x	x	
	Adaptive Instruction Approach							

## BIOGRAPHIES



Dr. Yak-Ping Huang graduated with her MS degree in Instructional Systems Technology from Indiana Univ. in U.S.A in 1991. In the following year she joined the Faculty of Educational Media and Library Sciences at Tamkang Univ. in

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Dr. Huang has lead more then 40 projects to develop e-learning courseware in her department; she also takes the role as a consultant for some companies of content developers in Taiwan. Her researches focus on web-based learning, technology-integrating education, evaluation of e-learning platform, message design, and instructional design. She has over 15 papers in these areas.

Prof. Chuang received his PhD (1990) in Industrial Tech. from Iowa State Univ., USA. He taught at N. Taiwan Normal Univ. as an Associate Prof. of Electrical



Engineering from 1991 to 1997. From 1997 to the present, he served as Prof. of Telecommunication and Tech. Vocational Edu., holding a joint appointment in the Graduate Institute of Applied Electronic Tech. In 2000, he was awarded by N. Science Council to be a visiting scholar at Electrical

Engineering Dept., Princeton Univ. He served as patent reviewer of Intellectual Property Office of Taiwan Gov. from 1994 to 2002. And he was invited as a researcher for improving the Vocational Training System of the Bureau of Employment and Training in Taiwan from 1995 to 2003. Besides, he has served for curriculum reform programs for Technical Vocational High School in Taiwan since 1981. For the past thirty years, he worked as an adviser for Asuno Electronic Company (1974~1977), Taiwan Sharp Company (1985~1987), NCLearn Technologies Company (2001~2004), Taiwan Yu-Dian Technology Company (2001~2004) and Chung-Hua Telecommunication Company (2001~2004) for production quality improvement and employee training. He has been invited as a program committee member for International Association of Science and Technology for Development in the field of Internet and Telecommunication since 1999. His research has covered Inf. Tech., Telecommunication, e-Learning and Technical Edu.