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Developing Effective Distance Instance Using Educational Theories and Content Management System for Distance Learning Course, Strategies, tool and Content

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Abstract

The purpose and objective of this research were to find out what the major learning material elements of effective asynchronous instruction from the opinions of experienced asynchronous students in Taiwan were. Also, the research identified if demographic backgrounds of students correlated to asynchronous learning outcomes.

The student questionnaire of affecting factors in asynchronous distance instruction (Liang, 2001) was the instrument for this study. This questionnaire identified five major elements in asynchronous distance instruction, namely abundant material design, the strategies of the course activities, learners' management, the technology knowledge of the learner, the quality of the system and the Internet.

The population of the study was college students of North Taiwanese colleges and universities who had experience in asynchronous distance instruction. The sample size of the study was 525 students as participants from six schools which were closed to Taipei.

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The data analysis used SPSS for Windows to do the statistical analysis. Descriptive Statistics, the Pearson Correlation Coefficients, Chi-square and the linear regression and correlation were used to analyze the data.

The first finding was that the participants thought that the quality of the system and Internet was the most important element of these five major elements. The three demographic variables had significant relationships with the entire major learning material elements, and only the gender variables had no significant relationship with the entire major learning material elements. The findings specifically indicated that learners' management had a significant relationship with gender. The age difference affected the choice of the Taiwanese students toward learners' management, abundant material design, and the technology knowledge of the learner.

Key word：Distance Instruction, Asynchronons Instruction, Education Theovies, Content Management system(CMS)

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運用教育理論與內容管理系統來發展有效率的網路課程 特別針對遠距離教學的課程、策略、工具及內容加以探討

鍾廣翰

摘要

本研究目的是藉由有非同步遠距離課程經驗的學生身上，來探討出什麼是造成高效率非同步遠距離教學，所需要的最主要因素。在非同步遠距離教學設計上，運用了教育理論與內容管理系統的整合。同時，本研究會探討學生本身的背景因素與非同步遠距離教學的成果是否有關聯。

本研究使用了影響非同步遠距離教學的因素問卷(Liang, 2001)，在問卷中，有五個主要因素被認定與非同步遠距離教學的效率最有關連，如：教材內容的豐富度、課程活動的策略、學生的管理、學生的科技知識背景以及系統與網路的品質和穩定度。本研究的對象是針對北部大學生有非同步遠距離課程經驗者，樣本數為 525 人。數據是運用 SPSS 系統來分析的，描述統計(Descriptive Statistics)、皮爾森相關分析(Pearson Coefficients)、卡方分析(Chi-square)、以及線性回歸分析(Linear Regression and Correlation)都有被使用分析數據。

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研究主要發現成果爲：1.大部分參與者都認爲網路與系統的品質是影響非同步遠距離教學成效的最大因素。2.有三個背景因素與非同步遠距離教學的主要因素有相關，只有性別變因與主要因素完全無顯著關連。3.在研究結果中有特別指出，學生的管理與性別是有關連的。4.不同年齡層會影響學生對教材內容的豐富度、學生的管理、與學生的科技知識背景之看法。

經由此研究的結果，希望能爲非同步遠距離教學的設計提供更明確、實用且有效的資料，幫助學校及老師在設計非同步遠距離教學課程時，能更有效率，並省下更多的時間與金錢。

關鍵字：非同步遠距離教學，內容管理系統，教育理論，網路教學

Research Problem Description

As technological experts develop more sophisticated devices, education became less limited to physical classrooms. Teachers and students were not limited to small and narrow spaces for learning and studying. Instead of traditional learning environments, students connected with the outside world from the Internet system to access more information and attain more knowledge (Yang, 1995). Distance learning was making learning more effective (Chen, 1998). In order to make the distance learning more effective, a content management system, was be used widely in the education system.

In 1999, the Taiwanese government developed the standards for colleges to start distance instruction, and also gave a clear definition for synchronous and asynchronous distance instruction (www.edu.tw., Retrieved Jun 2, 2007). Moreover, the education department developed "the plan for colleges to put teaching materials online", and subsidized eighteen schools to develop instructional materials for the planned virtual learning environment (http://www.iii.org.tw/etd/dl/html/dl home.htm, Retrieved May 28, 2007). In the future, students could get their credits and degrees through distance instruction from various institutions around the world without having to leave their hometown.

Currently, Taiwanese research studies of distance instruction are focused on five areas: system structure and implementation, giving suggestions and learning evaluation for certain classes, discussing cooperative learning, studying the learning theories of distance instruction, or discussing the motivation of distance learners. Many colleges spent a lot of time and money to develop on-line courses. (www.edu.tw., Retrieved Jun 2, 2007). The successful cases in Taiwanese education were Educities, Sctnet, and National Sun Yat-Sen Cyber University. However, these website platforms were

designed for individual usage purposes and were proprietary in design. The major disadvantages were high development cost, very little flexibility, and unpredictable maintenance expenses. Hence, finding the essential elements of effective distance instruction was important and necessary for Taiwanese education. Then, in recent years, many scholars tried to evaluate the possibility of using open-source development to design online learning environment (Carmichael, 2002). The most popular open-source content management systems were Drupal, Joomla, PHPNuke, and Xoops. With little to no software cost and a high degree of flexibility, these alternatives offer distinct advantages over proprietary systems. The development of open-source content management systems has been maturing rapidly. A CMS could help on-line instructors spend time and money necessary to build the best on-line instruction environment in order to have the best learning outcome.

Research Question

- What are the major learning material elements of effective CMS based asynchronous instruction in the opinions of experienced asynchronous students in Taiwan?
- Also, the research will identify if demographic backgrounds of students correlate to asynchronous learning material elements by using a CMS.

Hypothesis

In this research, the researcher identified the major elements delivered via a CMS that affect asynchronous distance instruction. The hypotheses were tested at a level of 0.05 statistical significance level ($\alpha \leqq 0.05$).

Hypothesis 1: There was a significant relationship between major elements and gender at $p \leqq .05$ level of significance.

Hypothesis 2: There was a significant relationship between abundant material design and gender at $p \leqq .05$ level of

significance.

Hypothesis 3: There was a significant relationship between the strategies of the course activities and gender at p ≦ .05 level of significance.

Hypothesis 4: There was a significant relationship between learners' management and gender at p ≦ .05 level of significance.

Hypothesis 5: There was a significant relationship between the technology knowledge of the learner and gender at p ≦ .05 level of significance.

Hypothesis 6: There was a significant relationship between the quality of the system, and Internet and gender at p ≦ .05 level of significance.

Hypothesis 7: There was a significant relationship between the major elements and age at p ≦ .05 level of significance.

Hypothesis 8: There was a significant relationship between abundant material design and age at p ≦ .05 level of significance.

Hypothesis 9: There was a significant relationship between the strategies of the course activities and age at p ≦ .05 level of significance.

Hypothesis 10: There was a significant relationship between learner's management and age at p ≦ .05 level of significance.

Hypothesis 11: There was a significant relationship between the technology knowledge of the learner and age at p ≦ .05 level of significance.

Hypothesis 12: There was a significant relationship between the quality of the system and Internet and age at p ≦ .05 level of significance.

Hypothesis 13: There was a significant relationship between major

elements and years in school at p ≦ .05 level of significance.

Hypothesis 14: There was a significant relationship between abundant material design and years in school at p ≦ .05 level of significance.

Hypothesis 15: There was a significant relationship between the strategies of the course activities and years in school at p ≦ .05 level of significance.

Hypothesis 16: There was a significant relationship between learners' management and years in school at p ≦ .05 level of significance.

Hypothesis 17: There was a significant relationship between the technology knowledge of the learner and years in school at p ≦ .05 level of significance.

Hypothesis 18: There was a significant relationship between the quality of the system, and Internet and years in school at p ≦ .05 level of significance.

Hypothesis 19: There was a significant relationship between major elements and the numbers of the asynchronous distance classes which the participants had taken at p ≦ .05 level of significance.

Hypothesis 20: There was a significant relationship between abundant material design and the numbers of the asynchronous distance classes which the participants had taken at p ≦ .05 level of significance.

Hypothesis 21: There was a significant relationship between the strategies of the course activities and the numbers of the asynchronous distance classes which the participants had

taken at p ≦ .05 level of significance.

Hypothesis 22: There was a significant relationship between learners' management and the numbers of the asynchronous distance classes which the participants had taken at p ≦ .05 level of significance.

Hypothesis 23: There was a significant relationship between the technology knowledge of the learner and the numbers of the asynchronous distance classes which the participants had taken at p ≦ .05 level of significance.

Hypothesis 24: There was a significant relationship between the quality of the system, and Internet and the numbers of the asynchronous distance classes which the participants had taken at p ≦ .05 level of significance.

Definition of Terms

In this research, there were some terms that need to be defined: effective, asynchronous distance instruction, experienced, major learning material elements and content management system.

Effective

The operational definition of effective in this research meat high learner satisfaction, high learning results, and frequently used (Chen, 1998, Hong, 1999).

Asynchronous Distance Instruction. The operational definition of asynchronous distance instruction was that instructors used software and the Internet tool to design on-line instruction systems to simulate the environments of teaching. Also, teachers and students did not need to join at the same time. Students could choose the materials and time to attend the learning (Lin, 1997).

Experienced Students

Moreover, the operational definitions of experienced students' meat that these students have had past experiences in taking asynchronous distance courses.

The Major Learning Material Elements

First, abundant material design meant how the material was presented holistically, how rich the material was, the difficulty of the material, and the structure of the material. Secondly, the strategies of the course activities included the styles of individual learning, the styles of posting a discussion board, course discussion and communication, and the channels of communication. Then, for learners' management, it included posting the learning schedules, providing response to inquiring about the grades, posting the sample of homework and the requirements for homework, and how the instructors evaluate the on-line activities. Fourth, the technology knowledge of the learner meant the attitudes of using a computer, the skills of using a computer, the ability of typing, the experience of using a computer, and the knowledge about a computer. Finally, the quality of the system and Internet stability of the system, convenience of using the Internet, the stability of the Internet, the speed of the Internet, and convenience of using on-line learning (Chen, 1998; Hong, 1999; .Liang, 2001; Yang, 1995).

North Taiwanese colleges and universities

The operational definition of North Taiwanese colleges and universities was that the colleges and universities are located above Xinzhu (Liang, 2001).

Content Management System (CMS)

The operational definition of a content management system is a computer application used to design and manage a dynamic, content driven, website. The CMSs discussed here are open-source options such as Drupal, Joomla, PHPNuke, Xoops, and so on (Huang, & Lin). These systems do not need a lot of maintenance. They could help to save money and time in the design of web material and site maintenance.

Summary

The purpose and the objective of this research were to find out what the major learning material elements of effective CMS based asynchronous instruction from the opinions of experienced asynchronous students in Taiwan were. Also, the research identified if demographic backgrounds of students correlated to asynchronous learning outcomes from the CMS. It is important to develop high quality tools for designing online learning website. The result of the study provided Taiwanese colleges and universities useful and practical information to design effective asynchronous distance instruction by using a CMS. Finally, this research could be the foundation for Taiwanese scholars to study CMS based distance instruction.

Review of the Literature

Distance instruction

There were two types of distance instruction. The first one was traditional distance instruction which uses radio, television, and mail to provide learning material, but did not use informational media and Internet technology. The second one was combining information media and Internet technology, and also provided two-way communication distance instruction (www.edu.tw/moecc/rs/disl/uc, Retrieved June 13, 2007). In this study, the distance instruction meant the one which used information media and Internet technology. According to Moore, Cookson and Donaldson (1990), distance instruction was comprised of learners, instructors and other students were in different place and at different times. Then the instructors delivered the learning material to students through electronic media or plane media, which the learners used to learn.

Synchronous and Asynchronous Distance Instruction

Based on Lin's study (1997), there were two categories of distance instruction, namely synchronous and asynchronous. Synchronous distance instruction means that all instructors and students need to join at the same time, and they could see each other and communicated immediately through video conference. Moreover, asynchronous distance instruction meant that instructors and students did not need to join at the same time. Students could decide their class time and chose the class material. For example, asynchronous distance instruction used e-mail, blackboard, discussion board, and other on-line teaching tools.

In Chen's study (1997), it was hypothesized that synchronous distance instruction should be more effective than traditional classroom instruction. However, because schools and instructors lacked skills to use and develop this model, synchronous distance instruction did not demonstrate that it was more effective. At present, most schools used asynchronous distance instruction to build "On-line Universities", or a "Virtual University". To sum up, because of

technology and budget problems, most Taiwanese universities and colleges used the asynchronous model in their distance instruction.

Content management system

"Content is King" (Gates, 1996). This sentence showed that people should pay attention to the inner quality, but not outside appearance. According to this idea, the major part of the website was its content. By using content management systems, people could easily delivery information through the Internet. People did not need the complex skills in order to make the website (Huang, & Lin, 2003).

The functions of content management system included collection, management, and publishing of information and interactivity (Boiko, 2001). Based on the study of Boiko (2001), major contents of content management system were:

- Collection system: the system was designed for employees to create, collect, build, organize the content and metadata, and transform the format.
- Management system: the storage system was designed for employees to use and manage the data. The system also included the Workflow module which can process input and output information effectively.
- Published system: The systems helped to input and extract data from the database, and followed predefined templates to publish in the website or other media.

The advantages of using a CMS were to low the skill level of manage the content of the website. Also, a CMS could help people from different levels to deal the information problems, such as adding, fixing, searching, and deleting information or data. Usually, when people selected a CMS, there are some points which should pay attention (Calvin, 2003; Robertson, 2002; Robertson, 2003):

一、 The types and styles of the websites: According to the classification

of an open-source CMS, CMSs can divide to Portals, Blogs, e-Commerce, Groupware, Forum, e-Learning and Miscellaneous. By deciding the size and types of the websites, it provided the direction for development and the styles of future sites.

二、 The functions: Different systems provided different contents. Even though, the function was the same, but the operation was different. People could choose a CMS based their needs.

三、 Visual appearance: The differentiations of CMSs provide creative freedom. Some systems designed the web page by using background theme. Others might combine the background theme with Cascading Style Sheet for format continuity.

Hence, based on the needs of the users, people could follow these main points to select CMS which suitable their personal usage.

On-line Technology in Teaching

There are two types of prevalent online technologies in teaching. First type is using content to integrate with the media, and putting the content of the course into the website. When the content of the course displayed on the website, other fields of related knowledge would show simultaneously. This was the way of showing the whole knowledge field. Moreover, the second type was using methods to integrate with teaching. By using the methods of Internet technology, the methods would combine with the teaching activities. In different types of classes, teachers could use online technology to diversify the activities (Lee, 2000). Also, in the study of Pan (2006), the strategies which practiced in online technology in teaching could be divided to five ways:

1. Coordinating with the content of the textbook, the website was designed for supplementary materials.
2. The content of the website was the self-compiled teaching material.
3. Combing websites and electronic databases used in teaching.
4. Designed for teachers' use.

5. Transferring the content of the website into learning tools.

The Advantages of On-line Learning

As technology grows, using information technology as an instructional media was overwhelming. Many educational institutions tried to use the Internet for delivery, both on campus and at a distance. According to the U. S. Department of Education (1997), 22 percent of American colleges and universities were offering some form of on-line learning. In 2004, a majority of all American college and universities were offering fully on-line courses enrolling approximately 2 million students. Allen and Seaman (2004) reported that 52.6 percent of institutions viewed on-line learning as critical to their institutions' overall long-term strategy. According to Smith (2001), there were some advantages for on-line learning, namely flexibility, self-paced learning, providing more opportunities, absence of labeling, written communication experience, and experience with technology. On-line learning was flexible. Students could work anywhere around the world, and they still could be educated. No matter how far from the school, or on a business trip, students still could finish their school work. Therefore, it was a good chance for colleges and universities to enroll international students and new audiences.

The Disadvantages of On-line Learning

On-line leaning could sometimes be overwhelming and possessed some disadvantages. Before educational institutions developed on-line courses, they should be aware of these problems and had sound plans for solving the difficulties. Typical difficulties concerned interaction and team building, administration of examinations, absence of oral presentation opportunities, technical problems, time cost of instructors, security issues, and institutional policy and budget issues (Zirkle, 2003; Green, 1998; Grandzol, 2004).

Before an educational institution initiated on-line courses, it should have a clear policy about the copyright for their on-line courses and how people could use other's materials. Also, the institution should clearly discuss academic

honesty. On-line plagiarism was not limited to only cheating on exams. In addition, many students went on-line to cut and pasted text for use in their assignments. Institutions had a huge issue when giving on-line examinations, and the issue of plagiarism. Therefore, institutions should plan ahead (Chen, 1998; Liang, 2001).

Educational Theory for On-line Learning

There were three adult learning theories used in on-line learning, namely Behaviorist theory, Cognitive Processing theory, and Constructivist theory (Ally, 2004; Janicki & Liegle, 2001). The first on-line learning system was based on the behaviorist approach to learning (Hong, 1999). The behaviorist theory was influenced by Thorndile (1913), and Skinner (1974). According to Thorndile (1913), people remembered things that lead to a positive effect. Skinner (1974) indicated that learning is a change in observable behavior caused by external stimuli in the environment. In the behaviorist theory, the role of instructors was to design environments that elicited desirable behaviors and extinguish undesirable behaviors. But not all learning was observable and it was hard to define desirable behavior. There was also more to learning than a change in behavior. Hence, on-line learning had moved from behaviorist to cognitive processing theory (Skinner, 1997; Lin, 1997).

By implanting the behaviorist theory into on-line learning a learner should be told the expectation and the standard of the evaluation, and learners should be able to check whether they have achieved the outcome of on-line courses or not. Learning materials should be arranged appropriately to promote learning. The material should be taken from simple to complex and from a knowledge level to application level (Skinner, 1997; Hong, 1999).

In cognitive processing theory, learning involved the use of memory, intelligence, motivation, thinking and reflection. The theory indicated that learning was an internal process and how much students learned depends on the processing ability of the learner, the amount of effort from the learner, the

level of learning processing (Craik & Tulving, 1975), and the existing knowledge structure of the learners (Abusubel, 1974). According to Anthony Gregorc-Mediation Ability theory (Hong, 1999), the learning environment should be orderly, predictable, stable, and practical. Also, the environment should be stimulus rich, allow freedom of movement, freedom of expression, and amenable rearrangement.

In cognitive processing theory, it was important to have the proper location of the information on the screen, the attributes of the screen, and the mode of delivery should be carefully designed (Alley, 2004). On-line learning materials should present between five and nine items on the screen in order to work effectively in memory (Miller, 1956). Moreover, on-line learning should provide different types of activities for different learning styles. Hence, learners could select appropriate activities to fit their own learning style.

According to Wilson (1997) and Cooper (1993), the theory has moved to constructivism. Constructivism theory emphasized that learners interpreted information and the world according to observation and process and analyze the information into their own knowledge. When instructors designed on-line learning materials, these three theories all could be used. Based on Ertmer and Newby's study (1993), Behaviorist theory could be used to teach facts. Cognitive processing theory could be used to teach processes and principles. Constructivist theory could be used to teach higher level thinking that improved personal meaning and situated and contextual learning (Ally, 2004, p.7).

According to constructivism theory, learning should be an active process. Instructors should help learners to apply knowledge in a practical situation. Learners should construct their knowledge rather than accepting the information from the instructors. Collaborative and cooperative learning should be encouraged to facilitate constructivist learning (Hooper & Hannafin, 1991; Johnson & Johnson, 1996; Palloff & Pratt, 1999). Learners should be

given time and opportunity to reflect. On-line discussion provided enough time for learners to think before they participate.

The Elements of On-line Learning

For task centered, the on-line environment provided flexible access for learners to reach more information. There was no limit for growing knowledge. If learners had skillful e-teachers, they could improve students' knowledge level and point them to the right direction. The task centered approach provided a chance for students to master their projects or assignments of the course (Carr-Chellman & Duchastel, 2000).

According to Bransford et al. (1999), it was necessary for on-line learning to be assessment centered. Because the on-line learning environment provided more chances and a diversity of opportunities for assessing student production, students could assess their own learning and the instructors had different choices to assess students. But in order to avoid adding to instructors' workload, on-line assessment tools were necessary. For example, the use of on-line computer-marked assessments could help to simulate the exercise and student understanding (Anderson, 2004). Moreover, instructors could use software tools to correct students' essays. As technology grows, auxiliary software for helping instructors' assessment would increase. However, the other challenge of on-line learning was providing high quality and quantity assessment which maintained the student interest. For solving this problem, a good way was to test the assessment on large populations when developing it. Therefore, instructors could have easy to use, reliable, and valid assessment while maintaining student interest's on-line (Carr-Chellman, & Duchastel, 2001; Hong 1999).

On-line learning was also community centered. From the community point of view, it allowed instructors to include social concerns in the learning design. Collaborative learning emphasized mutual engagement of learners in the learning process (Abrami & Bures, 1996). Cooperative learning focused on dividing work in order to achieve the group goal (Bruffe, 1993). The advantage

of collaborative learning was to encourage learners to think deeply and critically. Moreover, collaborative learning required less teacher imposed goal structuring than cooperative learning (Abrami & Bures, 1996).

Wager (1994) stated that "interaction is reciprocal events that require at least two objects and two actions. Interaction occurs when these objects and events mutually influence one another" (p.8). Interaction has always been valued in on-line learning (Anderson, 2004). Interaction allowed for learning control, facilitating programs based on learner input, and communication and acting as an aid to meaningful learning (Sims, 1999). Michal Moore was the first one to discuss the three types of interaction in distance education, namely student-student, student-teacher, and student-content (Moore, 1989). Then Aderson and Garrison (1998) added teacher-teacher, teacher-content, and content-content to the interaction.

The Major Learning Material Elements

According to Liang (2001), there were five major learning material elements which affected effective distance instruction.

First, abundant material design meant how the overall material was presented, how rich the material was, the difficulty of the material, and the structure of the material. Secondly, the strategies of course activities included the ways of individual learning, the styles of postings on discussion boards, course discussion and communication, and the channels of communication. Then, learners' management included posting the learning schedules, providing opportunity for inquiring about the grades, posting samples of homework and the requirements for homework, and how the instructors evaluated the on-line activities. Fourth, the technology knowledge of the learner meant the attitudes about using a computer, the skills of the student, the ability of typing, the experience of using a computer, and the knowledge about computers. Finally, the quality of the system and Internet included the stability of the system, convenience of using the Internet, the stability of the Internet,

the speed of the Internet, and convenience of using on-line learning (Chen, 1998; Hong, 1999; .Liang, 2001; Yang, 1995).

Abundant Material Design

Cai (2001) pointed out that abundant material design was one of five important elements to evaluate distance instruction. The material design should use the correct learning materials and terminology. Also, the material should cover the learning objective with enough depth to challenge the learner. The structure should be reasonable and systematic. When students tried to find information that they needed, they did not need to press the button too many times. Moreover, the difficulty of the material should be suited to the learners. The web design should be learner friendly. Learners could read, use, and understand easily. Each subtitle should be divided clearly, and words and colors should be friendly to learners. In order to keep students interested, the pictures and voice should be included in the design according to the goals established that are supported by the learning objectives.

Shi and Chen (2000) thought that abundant material design is the main element for distance instruction. Material design should fit the needs of the learners, and it should be rich in order to provide more support for learners. A study by Hong and Cai (1999) indicated that learner material should be abundant in order to attract students to learn and also stimulate students to think. In addition, based on Hong's study (1999), the material design was very important for implementing distance instruction. Especially, when people evaluated the distance instruction, the material design plays an important part. Hong's study mentioned that the material design should be rich to cover the needs of students and also the learning object. The structure of the material design should be user friendly. The web-design should be easy to read, use, and understand.

The Strategies of the Course Activities

In Liang's study (2001), the strategies of the course activities should include the styles of individual learning, the styles of posting discussion board,

course discussion and communication, and the channels of communication. Cao (2001) mentioned that good course activities should have communication channels, feedback, hint, and connection. In communication channels, the study pointed out that the instruction should have good discussion boards and posting areas. For feedback, the instructors should give suitable suggestions to learners and also encourage students to learn through the discussion board and posting tools. According to learning objectives, the instructors should give hints to help students to improve their learning. The distance instruction should also provide a good Internet connection for students to provide a more useful websites and information. *Learners' Management*

The Taiwanese education department emphasized that learners' management should be included in the asynchronous distance instruction (www.edu.tw, Retrieved June 12, 2007). Hong (1999) advocated that learners' management should include posting the names of learners, setting up the learning plan, providing grade checking, displaying homework and posting the requirement for homework, and posting the requirement for on-line activities. Posting the names of learners could help students to know their classmates. Then, setting the learning plan could provide the schedule for students and teachers to control the class. By providing grade checking, students could know their rank in the class in order to inspire them to learn. Also, displaying homework and posting the requirements for homework gave the students the basic ideas of how the teachers grade the homework, and what the homework should include. Moreover, posting the requirements for on-line activities encouraged students to join a clear on-line discussion, and gave them the clear outline how they will be graded.

The technology knowledge of the learner

Distance instruction was what students learned through on-line and computer systems. Hence, it was an important factor that students could access computers easily or not and the ability, knowledge, and attitude of students

toward the computers (Lin, & Chen, 2001). Also, the computer typing and reading skills were main factors in distance learning. Finally, people who were weak in computer communication could also affect their ability to learn (Lin, 1997; Yang, 1995).

The quality of the system and Internet

According to Hong's study (1999), there were some Internet factors which affected distance instruction: namely the speed of the Internet, the system connection, the on-line communications between students and teachers, the structure of on-line design, the grade requirement of on-line learning, and the web-design. Especially, the quality and the speed of the Internet was the major issue to affect students learning (Hong, 1999; Lin, & Chen, 2001). In Liang's research (2001), the result pointed out some the Internet problems in distance instruction. First one was the quality and the speed of the Internet. For example, the voice and the pictures can not be presented at the same time. The second one was the stability of the Internet. Finally, the last one was the cost. Learners need to pay for using the Internet. In Taiwan, it was not cheap to use the high quality Internet. Hence the cost became a big issue for distance learners.

Summary

The definition of asynchronous distance was that instructors and students did not need to join the class at the same time. Students could decide their class time and choose the class material through the internet. The asynchronous distance instruction provided more flexible learning than synchronous distance instruction (Lin, 1997). According to Smith (2001), there were some advantages for on-line learning, namely flexibility, self-paced learning, providing more opportunities, absence of labeling, written communication experience, and experience with technology.

The educational theories for on-line learning were Behaviorist Theory, Cognitive Processing Theory, and Constructivist Theory. The elements of

on-line learning were learner centered, task centered, assessment centered, community centered, and interaction. According to Liang (2001), the major learning material elements in this study was abundant material design, the strategies of the course activities, learners' management, the technology knowledge of the learner, and the quality of the system and Internet (Chen, 1998; Hong, 1999, Liang, 2001).

Methodology

Instrument

There was one instrument which was used in this research, namely the student questionnaire of affecting factors in asynchronous distance instruction (Liang, 2001). The student questionnaire of affecting factors in asynchronous distance instruction (Liang, 2001) was used to test the students' opinions toward asynchronous distance instruction delivered via a CMS and to see what the elements are that students think are important and necessary in their distance learning. This questionnaire identified five major elements in asynchronous distance instruction, namely abundant material design, the strategies of the course activities, learners' management, the technology knowledge of the learner, the quality of the system and the Internet. The instrument used a five point Likert-type scale. One represented "totally disagree" and five represents "totally agree". There were two parts in the questionnaire. The first part was what elements will affect distance learning. Then, the second part was what were the possible issues and difficulties when participating in distance instruction. In this study, the researcher only used the first part.

Description of the Research Design

In this study, the student questionnaire of affecting factors in asynchronous distance instruction (Liang, 2001) was the instrument for the survey. The researcher picked six schools which were mostly close to Taipei, and these schools were located in the North part of Taiwan. The power size of sampling was 500 participants (Krejice & Morgan, 1970). Moreover, descriptive statistics, the Pearson Correlation Coefficients, Chi-square, Kruskal Wallis test and the linear regression and correlation were used to analyze the data (Fraenkel & Wallen, 2006; Brewerton & Millward, 2001).

Validity

The student questionnaires of affecting factors in asynchronous distance instruction (Liang, 2001) had content validity, construct validity, and also used

item analysis to increase the instrument validity. For content validity, the instrument had literature support and was reviewed by a panel of experts. For construct validity, the instrument used principal component analysis to find out the major elements. Moreover, Kaiser-Meyer-Olkin (KMO) was used to find out the common elements between variables. According to Kaiser, if the number of KMO was smaller than 0.5 (<0.5), the instrument was not good for factor analysis. In this questionnaire, the number of KMO in affecting elements of asynchronous distance instruction was 0.868, so the instrument could be used to do the factor analysis. Moreover, the X value of Bartlett's Test of Sphericity was 2021.869 (f =231). Hence, it showed that there were common elements in the sampling group, and the instrument could do the factor analysis. Based on the factor analysis, the invalid questions were taken out of the questionnaire. In addition, the instrument had convergent validity (>0.01) and discriminate validity (>0.5) to increase construct validity. Also, the instrument used item analysis to find out the critical ratio (CR value) of each question. If the critical ratio of question arrived of the significant level ($\alpha<0.05$ or $\alpha>0.01$), it meant that the question could distinguish the difference between testers. This was also used to decide to keep the question or delete the question. By using item analysis, the instrument had strong validity.

Reliability

There was stability reliability in the student questionnaire of affecting factors in asynchronous distance instruction (Liang, 2001). For stability reliability, the author of the instrument did the pilot test and test-retest. For consistency reliability, the Cronbach's α of the instrument was between 0.7377 to 0.9238. The Cronbach's α was larger than 0.7. Hence the questionnaire had good reliability.

Description of the Population

The population was college students of North Taiwanese colleges and universities who had experience in asynchronous distance instruction delivered

via a CMS. The total number of the participants was 6023 people (www.edu.tw., Retrieved Jun 2, 2007).

Description of the Sample

Sampling Method

The researcher selected the schools which provided CMS based asynchronous distance instruction in the North part of Taiwan, and hand-pick the six schools which were mostly close to Taipei. The total was six schools. The students of these six schools were the participants.

Sample Size

In 2006, there were 27,795 people took asynchronous distance instruction classes (www.edu.tw., Retrieved Jun 2, 2007). The population was too large, and some schools were hard to access. Also, because of time and budget problems, the researcher narrowed down the sample to the schools which provided CMS based asynchronous distance instruction in order to reduce the number of participants. In 2006, the total number of students who joined and had experiences in asynchronous distance instruction were 6,023 people. According to Krejcie and Morgan (1970), out of a population at 6,023 people, the appropriate sample would be 500 people. In order to have the valid amount of returning questionnaires, the researcher had 525 students as participants.

Procedure

The researcher sent consent forms to the authors of the instrument, and asked their permission to use their questionnaire. Then, the researcher asked permission from the schools where students were selected to do the survey. Once the researcher had the permission from the authors and the schools, the researcher set up the schedules for doing the survey. The researcher hired a tester to assist in the survey process, and the tester had knowledge of doing research and also a student with high standing in the Ed.D. program of St. Mary's University. This reduced the administration bias. The survey took about 30 minutes, and before distributing the questionnaire, the tester explained the purpose and importance of the study to the participants. Also, the

tester explained to the participants that they had the right to withdraw from the study anytime. After the survey, the tester collected the answers, and the researcher analyzed and counted the data. The tester helped to do a second check to make sure that the analysis was correct. The whole process of study took about one month to finish the survey.

Data Analysis

The data analysis used SPSS for Windows to do the statistical analysis. Descriptive Statistics was used to provide the basic analysis of participants, for example mean, median, standard deviation, and so on. The Pearson Correlation Coefficients was used to determine any significance relationship between the five major elements and age or gender (Frankel & Wallen, 2006). Also, Chi-square was used to determine what the major elements in the CMS based asynchronous distance instruction are. Moreover, the linear regression and correlation was used to determine the relationship between the elements, age, and gender.

Summary

The student questionnaire of affecting factors in asynchronous distance instruction (Liang, 2001) was the instrument for this study. The instrument tested the students' opinions toward CMS based asynchronous distance instruction and to see what the elements are that students think were important and necessary in their distance learning. This questionnaire identified five major elements in asynchronous distance instruction delivered via a CMS, namely abundant material design, the strategies of the course activities, learners' management, the technology knowledge of the learner, the quality of the system and the Internet. Also, the instrument used Five Point Likert Scale. The instrument had content validity, construct validity, and also uses item analysis to increase the instrument validity. Moreover, the instrument had stability reliability, and consistency reliability.

The population of the study was college students of North Taiwanese

colleges and universities who had experience in CMS based asynchronous distance instruction. The researcher selected the schools which provided asynchronous distance instruction in the North part of Taiwan, and hand-pick the six schools which were mostly close to Taipei. The total was six schools. The students of these six schools were the participants. The total number of the participants was 6023 people (www.edu.tw., Retrieved Jun 2, 2007). According to Krejcie and Morgan (1970), out of a population at 6,023 people, the appropriate sample would be 500 people. In order to have the valid amount of returning questionnaires, the researcher had 525 students as participants.

The data analysis used SPSS for Windows to do the statistical analysis. Descriptive Statistics was used to provide the basic analysis of participants, for example mean, median, standard deviation, and so on. The Pearson Correlation Coefficients was used to determine any significance relationship between the five major elements and age or gender (Frankel & Wallen, 2006). Also, Chi-square was used to determine what the major elements in the asynchronous distance instruction are. Moreover, the linear regression and correlation was used to determine the relationship between the elements, age, and gender.

Results

The purpose of this study was to find out the major learning material elements of effective CMS based asynchronous instruction in the opinions of experienced asynchronous students in Taiwan, and also to identify the relationship between demographic backgrounds of students and asynchronous learning material elements, namely the technology knowledge of the learner, the quality of the system and Internet, learners' management, abundant material design, and the strategies of course activities. Moreover, this research survey was filled by students who had experience in CMS based asynchronous instruction from five universities which were close to Taipei.

In this study, the student questionnaire of affecting factors in asynchronous distance instruction (Liang, 2001) and a Demographic questionnaire were used as the instruments for the survey. The descriptive statistics, the Pearson Correlation Coefficients, Chi-square, Kruskal Wallis test and the linear regression and correlation were used to analyze the data (Fraenkel & Wallen, 2006; Brewerton & Millward, 2001).

Demographic Characteristic

A total of 525 surveys were sent to the students. There were only 383 surveys that could be used after deleting the ineffective and incomplete surveys. The return rate was 72.95%.

There were four major demographic variables in this study, including gender, age, grade, and how many asynchronous distance classes the participants had taken. The descriptive statistics was used to analyze the demographic backgrounds and also used to find the answer for question one.

Gender

Gender was categorized into two groups: male and female. There were 233 male (60.8%), and 150 female (39.2%). The results showed that there were more male participants in this study. Please see Table 1.

Age

There were seven categories for age: 18 years old, 19 years old, 20 years old, 21 years old, 22 years old, 23 years old, and over 24 years old. The result indicated that there were 29 participants (7.6%) that were 18 years old, 94 participants (24.5%) that were 19 years old, 97 participants (25.3%) that were 20 years old, 86 participants (22.5%) that were 21 years old, 41 participants (10.7%) that were 22 years old, 17 participants (4.4%) that were 23 years old, 19 participants (5.0%) that were over 24 years old. The finding showed that the most participants in the study were age 20. Please see Table 1.

Years in school

For the years in school, it was categorized into four groups: freshmen, second year, third year, and senior year. There were 82 participants (21.4%) for the freshmen, 137 participants (137%) for second year, 95 participants (24.8%) for the third year, and 69 participants (18%) for the senior year. The second year had the most participants for this study. Please see Table 1.

The Numbers of the Asynchronous Distance Classes Which the Participants Had Taken

The number of asynchronous distance classes which the participants took before were divided into four categories: one class, two classes, three classes, and over four classes. The results showed that there were 202 participants (52.7%) who took one asynchronous class before, 68 participants (17.8%) took two classes before, 62 participants (16.2%) took three classes before, and 51 participants (13.3%) took over four classes before. The findings showed that most participants took one asynchronous class in this study. Please see Table 1.

Table 1

Summary of Demographic Characteristics (N=383)

Variables	Categories	Frequency	Percentage
Gender	Male	233	60.80%
	Female	150	39.20%
Age	18	29	7.60%
	19	94	24.50%
	20	97	25.30%
	21	86	22.50%
	22	41	10.70%
	23	17	4.40%
	over 24	19	5.00%
Years in school	Fresh men	82	21.40%
	Second year	137	35.80%
	Third year	95	24.80%
	Senior Year	69	18%
The numbers of asynchronous classes which the participants took before	One class	202	52.70%
	Two classes	68	17.80%
	Three classes	62	16.20%
	over four classes	51	13.30%

The Analysis of the Major Learning Material Elements of Affecting Effective Asynchronous Instruction

The student questionnaire of affecting factors in asynchronous distance instruction (Liang, 2001) used a five point Likert type scale; therefore the result could show the level of participants' opinions toward the major learning material elements of affecting effective asynchronous instruction. In this questionnaire, there were five major learning material elements of affecting effective CMS based asynchronous instruction, namely abundant material design, the quality of the system and Internet, the technology knowledge of the learner, learners' management, and the strategies of the course activities. By

using descriptive statistics to analyze the data, the findings showed that most participants (19.9452) selected the quality of the system and Internet as the major learning material element of affecting effective asynchronous instruction. The second learning material element which participants selected was the technology knowledge of the learner (17.5065). The third learning material element was abundant material design (14.3055). The next learning material element which the participants chose was learners' management (13.7559). The last learning material element of affecting effective asynchronous instruction was the strategies of the course activities (13.6841).

Hence, the first major learning material elements of affecting effective CMS based asynchronous instruction was the quality of the system and Internet, and followed by the technology knowledge of the learner, abundant material design, learners' management, and the strategies of the course activities. In summary, the participants thought that the quality of the system and Internet was the first major element to affect their learning in asynchronous instruction. Then, the second major element was the technology knowledge of the learner, followed by the abundant material design and learners' management. The least important of the five elements was the strategies of the course activities.

Table 2

Summary of the Major Learning Material Element of Affecting Effective Asynchronous Instruction (N=383)

The major learning material elements of affecting effective asynchronous instruction	Mean
The quality of the system and Internet	19.95
The technology knowledge of the learner	17.51
Abundant material design	14.31
Learners' management	13.76

The strategies of the course activities	13.68

The Analysis of the Relationships between Demographic Background of Students and the Major Learning Material Elements of Affecting Effective Asynchronous Instruction

There were four demographic variables in this study, namely gender, age, years in school, and how many asynchronous distance classes participants had taken. The five major learning material elements of affecting effective asynchronous instruction were the quality of the system and the Internet, the technology knowledge of the learner, abundant material design, learners' management, and the strategies of the course activities.

The data analysis used SPSS for Windows to do the statistical analysis. The Pearson Correlation Coefficients and Chi-Square Test were used to determine any significant relationships between the five major elements and age or gender (Frankel & Wallen, 2006). Moreover, the linear regression and correlation were used to determine the relationship between the elements, age, and gender.

Hypothesis 1: There is a significant relationship between major elements and gender at $p \leqq .05$ level of significance (Gender and Major Learning Material Elements)

The data was analyzed by using Chi-Square Test in order to determine if there was any significant relationship between gender and the major elements. According to Table 3, the data showed that there was no significant difference between major elements and gender variable ($p=0.084 > p=0.05$). Hence, the Null hypothesis 1.1 was accepted, and the hypothesis 1 was rejected, because $p=0.084 > p=0.05$. There was no significant relationship between the major elements and gender. In addition, by analyzing each major learning material element, only learners' management had a significant difference between the two genders ($p=0.03 \leqq p=0.05$). The technology knowledge of the learner

(p=0.059 > p=0.05), the quality of the system and Internet (p=0.145 > p=0.05), abundant material design (p=0.868 > p=0.05), and the strategies of the course activities (p=0.506 > p=0.05) showed no significant relationships with gender variable. In summary, the result showed that in this study, there was no significant relationship between any of the major elements and gender variable, but only learners' management had a significant relationship with gender.

Table 3

The Chi-Square Test of Major Learning Material Elements and Gender (N=383)

	The technology knowledge of Learner	The quality of the system and Internet	Learners' management	Abundant material design	The strategies of the course activities	Total
Chi-Square Value	3.575	2.126	8.727	.027	.442	2.983
df	1	1	1	1	1	1
p	.059	.145	.003*	.868	.506	.084

* Denotes p ≦ .05

By using the Pearson Correlation Coefficients and the linear regression and correlation to analyze the gender variable and the entire major learning material elements, the result indicated that R value = -.102, and this meant gender variable and entire major elements are negatively correlated. Also, p=.023 ≦p=.05, so the data showed that the gender variable had significance with the entire five major learning material elements. Please see Table 4. Moreover, according to Table 5, α=.046 < α=.05, this data showed that gender variable and five major learning material elements was correlated and had significance. The result also showed that the gender variable had correlation to the five major learning material elements. In addition, according Table 6, P= .046< p=.05, and the data indicated that gender and the major learning material elements had a significant difference. Also, there was correlation

between gender and the major learning material elements.

Table 4

Pearson Correlation Coefficients Analysis for Gender and Major Learning Material Elements

		The five major learning material elements	Gender
Pearson Correlation Coefficients	The five major learning material elements	1	-.102
	Gender	-.102	1
p	The five major learning material elements		.023*
	Gender	.023*	
N	The five major learning material elements	381	381
	Gender	381	381

* Denotes p ≦ .05

R Value > 0 = Positive correlate; R Value< 0 = Negative correlate

Table 5

The Linear Regression and Correlation to Analyze the Gender and Major Learning Material Elements

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	605.325	1	605.325	4.015	.046 *
Residual	57144.428	379	150.777		
Total	57749.753	380			

Dependent Variable: Major learning material elements

* Denotes α < .05

Model	Unstandardized Coefficients		Standardized	t	Sig.	95% Confidence Interval of the difference	
	B	Std. Error	Beta			Lower	Upper
(constant)	80.827	1.003		80.618	0	78.855	82.798
Gender	-2.58	1.288	-0.102	-2.004	0.046*	-5.112	-0.048

Table 6

The Linear Regression and Correlation to Analyze the Gender and Major Learning Material Elements

a. Dependent Variable: Major learning material elements

* Denotes p ≦ .05

Hypothesis 7: There is a significant relationship between the major elements and age at p ≦.05 level of significance. (Age and Major Learning Material Elements)

After the Chi-Square Test, the results showed there was a significant relationship between the entire major elements and age (p=0.006≦ p=0.05). Please see Table 7. Hypothesis 7 was accepted, and the null hypothesis 7.1 was rejected. Hence, there was a significant relationship between the major elements and age. By analyzing each element, the findings showed that there were only the quality of the system and Internet (p=0.432 > p=0.05) and the strategies of the course activities (p=0.071> p=0.05) which had no significant relationships with age variable. Moreover, the technology knowledge of the learner (p=0.000 ≦ p=0.05), learners' management (p=0.005 ≦ p=0.05), and abundant material design (p=0.028 ≦ p=0.05) had significant relationships with age variable. The result meant that the age difference affected the participants to choose the rank of the major learning material elements.

However, there were only two elements which were not affected by age variable, namely the quality of the system and Internet, and the strategies of the course activities. According to Table 8, α=.046 <α=.05, this data showed that the age variable and the major learning material elements had significant relationships.

Table 7

The Chi-Square Test of Major Learning Material Elements and Age (N=383)

	The technology knowledge of Learner	The quality of the system and Internet	Learners' management	Abundant material design	The strategies of the course activities	Total
Chi-Square Value	31.350	5.919	18.758	14.149	11.617	17.930
df	6	6	6	6	6	6
p	.000*	.432	.005*	.028*	.071	.006*

* Denotes p ≦ .05

Table 8

The Linear Regression and Correlation to Analyze the Age and Major Learning Material Elements

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2334.528	6	389.088	2.626	.046 *
Residual	55415.225	374	148.169		
Total	57749.753	380			

- Predictors: (Constant), 18 years old, 19 years old, 20 years old, 21 years old, 22 years old, 23 years old, over 24 years old

b. Dependent Variable: Major learning material elements

* Denotes α < .05

Hypothesis 13: There is a significant relationship between the major elements and years in school at p ≦ .05 level of significance (Years in school and

Major Learning Material Elements)

In this study, years in school were divided into four levels, namely freshmen, second year, third year, and senior year. Also, there were five major learning material elements which were discussed in this research, namely abundant material design, the strategies of the course activities, learners' management, the technology knowledge of the learner, and the quality of the system and Internet. According to Table 9, the finding indicated that the entire major learning material elements had a significant relationship with years in school variable (p=0.017 ≦ p=0.05). In addition, there was also a significant relationship between the technology knowledge of the learner (p=0.025 ≦ p=0.05) and years in school. However, the quality of the system and Internet (p=0.08 > p=0.05), learners' management (p=0.104 > p=0.05), abundant material design (p=0.862 > p=0.05), and the strategies of the course activities (p=0.492> p=0.05) had no significant relationships with the years in school variable. In summary, the findings pointed out that in the opinions of the entire major elements and the technology knowledge of the learner, the years in school variable influenced the participants choice. Then, the years in school variable had no influence in participants' choices of the quality of the system and Internet, learners' management, abundant material design, and the strategies of the course activities.

Table 9

The Chi-Square Test of Major Learning Material Elements and Grade (N=383)

	The technology knowledge of Learner	The quality of the system and Internet	Learners' management	Abundant material design	The strategies of the course activities	Total
Chi-Square Value	9.348	6.752	6.164	0.747	2.406	10.188
df	3	3	3	3	3	3
p	.025*	.080	.104	.862	.492	.017*

* Denotes p ≦ .05

Hypothesis19: There is a significant relationship between the major elements and the Numbers of the Asynchronous Distance Classes Which the Participants Took Before (The Numbers of the Asynchronous Distance Classes Which the Participants Took Before and Major Learning Material Elements)

The numbers of the asynchronous distance classes which the participants took before were divided into four categories: one class, two classes, three classes, and over four classes. After a Chi-Square Test, the results indicated that the entire major elements ($p=0.036 \leqq p=0.05$) and the technology knowledge of the learner ($p=0.015 \leqq p=0.05$) had significant relationships with the numbers of classes which were taken. Please see Table 10. Also, according to Table 10, it showed that the number of the asynchronous distance classes which the participants took before had no significant relationships with the quality of the system and Internet ($p=0.059 > p=0.05$), learners' management ($p=0.513 > p=0.05$), abundant material design ($p=0.180 > p=0.05$), and the strategies of the course activities ($p=0.171 > p=0.05$). Hence, the result pointed that the numbers of the asynchronous classes which the participants took before affected their choice in the entire major learning material elements and the choice of the technology knowledge of the learner. However, the numbers of the asynchronous classes which the participants took before had no influence in selecting the quality of the system and Internet, learners' management, abundant material design, and the strategies of the course activities.

Table 10

The Chi-Square Test of Major Learning Material Elements and the Numbers of the Asynchronous Classes Which the Participants Took Before (N=383)

	The technology knowledge of Learner	The quality of the system and Internet	Learners' management	Abundant material design	The strategies of the course activities	Total
Chi-Square Value	10.514	7.457	2.299	5.169	5.011	8.528
df	3	3	3	3	3	3
p	.015*	.059	.513	.16	.171	.036*

* Denotes p ≦ .05

Testing the Hypothesis

The raw data were colleted from 383 participants who completed the student questionnaire of affecting factors in asynchronous distance instruction. The data analysis that was used to do the statistical analysis was SPSS for Windows. The Pearson Correlation Coefficients and Chi-Square test were used to determine any significant relationship between the five major elements and age or gender (Frankel & Wallen, 2006). Moreover, the linear regression and correlation was used to determine the relationship between the elements, age, and gender. The findings of this research will help to test the twenty-four hypotheses in this study.

Q1. What are the Major Learning Material Elements of Affecting Effective CMS based Asynchronous Instruction in the Opinions of Experienced Asynchronous Students in Taiwan?

According to Table 2, the findings showed that the means of each of major learning material elements are 19.95 for the quality of the system and Internet, 17.51 for the technology knowledge of the learner, 14.31 for abundant material design, 13.76 for learners' management, and 13.68 for the strategies of the course activities. From the data, the results indicated that the participants thought the quality of the system and Internet was the most important element of these five major learning material elements. Then, the elements ranking from high to low were the technology knowledge, abundant material design,

learners' management, and the last one was the strategies of the course activities.

Table 11

Summary of the Rank of the Major Learning Material Elements

The major learning material elements of affecting effective asynchronous instruction	Mean	Rank
The quality of the system and Internet	19.95	1
The technology knowledge of the learner	17.51	2
Abundant material design	14.31	3
Learners' management	13.76	4
The strategies of the course activities	13.68	5

the major learning material elements. Also, there was correlation between gender and the major learning material elements.

After conducting a Chi-Square Test, the results showed that there was a significant difference between the entire major elements and age ($p=.006 \leqq p=.05$). Please see Table 7. Moreover, according to Table 8, $\alpha=.046 < \alpha=.05$, and this data pointed out that the age variable and the major learning material elements had a significant difference.

According to Table 9, by using the Chi-Square Test, the finding indicated that the major learning material elements had a significant difference with the grade variable ($p=.017 \leqq p= .05$).

By using Chi-Square Test, the results indicated that the major elements ($p=.036 \leqq p=.05$) had a significant relationship with the numbers of classes which the participants had taken.

Table 12

Summary of Question 2

Demographic Variables	Stat. Test	P	Result
Gender	Chi-Square Test Pearson Correlation Coefficients, The linear regression and correlation	P=.084 P=.023 α=.046	No significant relationship Significance Negative correlation
Age	Ch-Square Test, The linear regression and correlation	P=.006 α=.046	Significant relationship
Years in school	Ch-Square Test	P=.017	Significant relationship
The numbers of classes which the participants had taken.	Chi-Square Test	P=.036	Significant relationship

Hypothesis

There were twenty-four hypotheses in this study, and there were four demographic variables, including gender, age, years in school, and the number of classes which the participants had taken. Also, there were five major learning material elements in this research, namely the technology knowledge of the learner, the quality of the system and Internet, learners' management, abundant material design, and the strategies of the course activities. The Chi-Square test was used as the statistical analysis to examine the hypothesis in this study.

Hypothesis 1 to 6

Hypothesis 1: There is a significant relationship between major elements and gender at $p \leqq .05$ level of significance. Hypothesis 2: There is a significant relationship between abundant material design and gender at $p \leqq .05$ level of significance. Hypothesis 3: There is a significant relationship between the strategies of the course activities and gender at $p \leqq .05$ level of significance. Hypothesis 4: There is a significant relationship between learners' management and gender at $p \leqq .05$ level of significance. Hypothesis 5: There is a significant relationship between the technology knowledge of the

learner and gender at p ≦ .05 level of significance. Hypothesis 6: There is a significant relationship between the quality of the system, and Internet and gender at p ≦ .05 level of significance. Form the above, Hypothesis 1 to 6 were tested if there were any significant relationships between gender, the entire five major learning material elements, and each major learning material elements. After examining the data by using the Chi-Square test, the result showed that for hypothesis 1, the Chi-square value = 2.883, *df* =1, and p = .084. Because p = .084 > p = .05, the hypothesis 1 was rejected, and the null hypothesis 1.1 was accepted. This meant that there was no significant relationship between the major elements and gender. The gender variable did not affect which were considered to be major elements of distance learning. Then, according to Table 3, for hypothesis 2, the Chi-Square value = .027, *df* = 1, and p = .868. P =.868 > p = .05, so hypothesis 2 was rejected, and the null hypothesis 2.1 was accepted. The finding also indicated that there was no significant relationship between abundant material design and gender. The gender variable did not affect how the participants felt about abundant material design in asynchronous learning. Moreover, hypothesis 3 was testing the strategies of course activities and gender. After conducting a Chi-Square test, the Chi-Square value = .442, *df* = 1, p = .506. Because p = .506 > p =.05, the hypothesis 3 was rejected, and the null hypothesis 3.1 was accepted. Also, the strategies of the course activities did not have any significant difference with gender. The gender of the participants did not affect how participants felt about course activities. In addition, according to Table 3, for hypothesis 4, the Chi-Square vale = 8.727, *fd* = 1, and p = .003. P= .003 ≦ p= .05, hence the hypothesis 4 was accepted, and the null hypothesis 4.1 was rejected. There was a significant relationship between learners' management and gender. The gender of the participants affected how the participants ideas of the learners' management in the asynchronous learning. Moreover, for hypothesis 5, it

tested the technology knowledge of the learner and gender. The Chi-square value for hypothesis 5 is 3.575, *df* = 1, and p = .059. The hypothesis 5 was rejected (p = .059 > p = .05), and the null hypothesis 5.1 was accepted. This result of hypothesis 5 pointed out that there was no significant relationship between the technology knowledge of the learner and gender. The gender of the participants did not affect the level of the technology knowledge of the learner. Then, for hypothesis 6, the Chi-Square value = 2.126, *df* = 1, and p = .145. Because p = .145 > p = .05, hypothesis 6 was rejected, and the null hypothesis 6.1 was accepted. Hence, there was no significant relationship between the quality of the system and Internet, and gender. The gender of the participants did not affect participant ideas about the quality of the system and Internet. In summary, the findings for hypothesis 1 to 6 showed that the gender variable was the only variable that affected learners' ideas of management of asynchronous learning. But for the overall major elements, the technology knowledge of the learner, the quality of the system and Internet, abundant material design, and the strategies of the course activities, was not significantly influenced by the gender variable.

Hypothesis 7 to 12

Hypothesis 7: There is a significant relationship between the major elements and age at p ≦ .05 level of significance. Hypothesis 8: There is a significant relationship between abundant material design and age at p ≦ .05 level of significance. Hypothesis 9: There is a significant relationship between the strategies of the course activities and age at p ≦ .05 level of significance. Hypothesis 10: There is a significant relationship between learner's management and age at p ≦ .05 level of significance. Hypothesis 11: There is a significant relationship between the technology knowledge of the learner and age at p ≦ .05 level of significance. Hypothesis 12: There is a significant relationship between the quality of the system and Internet and age at p ≦ .05 level of significance. Hypothesis 7 to hypothesis 12 tested the age variable, the entire major learning material elements, and each major learning material

element. After examining the data using a Chi-Square test, hypotheses 7, 8, 10, and 11 were accepted. Then, hypotheses 9 and 12 were rejected. In addition, the Chi-Square value for hypothesis 7 was 17.930, *df* = 6, and p = .006 (≦ p = .05). Hence, hypothesis 7 was accepted, and the null hypothesis 7.1 was rejected. There was a significant relationship between the major elements and age. The age of the learner was a significant variable in what the participants considered to be major elements in asynchronous instruction. Then for hypothesis 8, the Chi-Square value = 14.149, *df* = 6, and p = .028 (≦ p = .05). Therefore, hypothesis 8 was accepted, and the null hypothesis 8.1 was rejected. There was a significant relationship between abundant material design and age was a significant variable in the level of importance given to the material design in asynchronous instruction. Moreover, Hypothesis 9 tested the relationship between the strategies of course activities and age. According to Table 7, the Chi-Square value = 11.617, *df* = 6, and p = .071 (> p = .05). So hypothesis 9 was rejected, and the null hypothesis 9.1 was accepted. There was no significant relationship between the strategies of the course activities and age. Age did not show as a significant variable in how important the participants feel that the strategies of the course activities were in affecting their learning. Then after conducting a Chi-Square test for learners' management and gender, the results showed that the Chi-Square value =18.758, *df* = 6, and p= .005 (≦ p= .05). Therefore, hypothesis 10 was accepted, and the null hypothesis 10.1 was rejected. There was a significant relationship between learner's management and age. Age showed as a significant variable in influencing learners' management in affecting their learning. Moreover, according to Table 7, the Chi-Square value for hypothesis 11 was 31.350, *df* = 6, and p = .00 (≦ p = .05). Hence, hypothesis 11 was accepted, and the null hypothesis 11.1 was rejected. The finding indicated that there was a significant relationship between the technology knowledge of the learner and age. Age

was a significant factor in determining the level of the technology knowledge of the learner. Finally, the Chi-Square value for hypothesis 12 is 5.919, *df*= 6, and p= .432 (> p = .05). So hypothesis 12 was rejected, and the null hypothesis 12.1 was accepted. The finding also indicated that the quality of the system and Internet did not have any significant difference with age. Age did not affect the participant's ideas about the quality of the system and Internet.

Hypothesis 13 to 18

Hypothesis 13: There is a significant relationship between major elements and years in school at p ≦ .05 level of significance. Hypothesis 14: There is a significant relationship between abundant material design and years in school at p ≦ .05 level of significance. Hypothesis 15: There is a significant relationship between the strategies of the course activities and years in school at p ≦ .05 level of significance. Hypothesis 16: There is a significant relationship between learners' management and years in school at p ≦ .05 level of significance. Hypothesis 17: There is a significant relationship between the technology knowledge of the learner and years in school at p ≦ .05 level of significance. Hypothesis 18: There is a significant relationship between the quality of the system, and Internet and years in school at p ≦ .05 level of significance. Hypotheses 13 to 18 tested years in school variable, the entire major learning material elements, and each element. There were only two hypotheses, 13 and 17, that were accepted. Hypotheses 14, 15, 16, 18 were rejected. According to Table 9, the Chi-Square value for hypothesis 13 was 10.188, *df* = 3, p = .017 (≦ p= .05). Hence, hypothesis 13 was accepted, and the null hypothesis 13.1 was rejected. There was a significant relationship between the major elements and years in school. The years in school variable was significant in how important the participants considered major material elements to be in affecting their learning. After examining the Chi-Square test in abundant material design and years in school for hypothesis 14, the Chi-Square value = 0.747, *df* = 3, and p = .862 (> p= .05). So, hypothesis 14 was rejected, and the null hypothesis 14.1 was accepted. This result also showed

that there was no significant relationship between abundant material design and years in school. The years in school did not affect the participant's ideas of how important material design is to asynchronous instruction. Moreover, for hypothesis 15, the Chi-Square value = 2.406, *df* = 3, and p = .492 (> p= .05). Hence, hypothesis 15 was rejected, and the null hypothesis 15.1 was accepted. There was no significant relationship between the strategies of the course activities and years in school. The years in school did not affect the participants' ideas of how important strategies of the course activities are to asynchronous learning. Then, the Chi-Square value for hypothesis 16 was 6.164, *df* = 3, and p = .104 (> p = .05). Therefore, hypothesis 16 was rejected, and the null hypothesis 16.1 was accepted. This also meant that the learners' management did not have any significant difference with years in school. The years in school did not affect the participants' ideas of the importance of learners' management. After examining the technology knowledge of the learner and grade for hypothesis 17, the Chi-Square value = 9.348, *df* = 3, and p= .025 (≦ p=.05). So hypothesis 17 was accepted, and the null hypothesis 17.1 was rejected. The finding indicted that there was a significant relationship between the technology knowledge of the learner and years in school. The years in school did not have a significant affect on partipants ideas of the technology knowledge of the learner in the asynchronous learning environment. Finally, according Table 9 in order to test hypothesis 18, the Chi-Square value = 6.752, *df* = 3, and p = .080 (> p = .05). Hence, the hypothesis 18 was rejected, and the null hypothesis 18.1 was accepted. Therefore, there was no significant relationship between the quality of the system and Internet, and grade. The years in school did not significantly affect the participants' ideas about the quality of the system and Internet.

Hypothesis 19 to 24

Hypothesis 19: There is a significant relationship between major elements and the numbers of the asynchronous distance classes which the participants

had taken at p ≦ .05 level of significance. Hypothesis 20: There is a significant relationship between abundant material design and the numbers of the asynchronous distance classes which the participants had taken at p ≦ .05 level of significance. Hypothesis 21: There is a significant relationship between the strategies of the course activities and the numbers of the asynchronous distance classes which the participants had taken at p ≦ .05 level of significance. Hypothesis 22: There is a significant relationship between learners' management and the numbers of the asynchronous distance classes which the participants had taken at p ≦ .05 level of significance. Hypothesis 23: There is a significant relationship between the technology knowledge of the learner and the numbers of the asynchronous distance classes which the participants had taken at p ≦ .05 level of significance. Hypothesis 24: There is a significant relationship between the quality of the system, and Internet and the numbers of the asynchronous distance classes which the participants had taken at p ≦ .05 level of significance.

Hypotheses 19 to 24 tested the numbers of the asynchronous classes which the participants had taken, the entire major learning material elements, and each element. There were only two hypotheses, 19 and 23, which were accepted. The hypotheses 20, 21, 22, and 24 were rejected. According to Table 10, the Chi-Square value for the entire major elements was 8.528, *df* = 3, and p = .036 (≦ p = .05). Because p = .036 ≦ p = .05, the hypothesis 19 was accepted, and the null hypothesis 19.1 was rejected. The results indicated that there was a significant relationship between the entire major elements and the numbers of the asynchronous classes which the participants had taken. The numbers of the asynchronous classes which the participants had taken affected the participants' ideas of what level of importance they considered major elements to be. Then, after examining the Chi-Square test in abundant material design for hypothesis 20, the Chi-Square value = 5.169, *df* = 3, p= .16 (> p = .05). Hence, hypothesis 20 was rejected, and the null hypothesis 20.1 was accepted. The finding pointed out that abundant material design did not have

any significant relationship with the numbers of the asynchronous classes which the participants had taken. The numbers of the asynchronous classes which the participants had taken did not affect the participants level of importance considered to be given to the material design. Moreover, after examining the strategies of the course activities for hypothesis 21, the Chi-Square vale = 5.011, *df* = 3, and p = .171 (> p = .05). Therefore, hypothesis 21 was rejected, and the null hypothesis 21.1 was accepted. This also meant that the strategies of the course activities did not have any significant difference with the numbers of the asynchronous classes which the participants had taken. The numbers of the asynchronous classes which the participants had taken did not affect the participant's choice on the level of importance of strategies of the course activities. According to Table 10, the Chi-Square value for hypothesis 22 was 2.299, *df* = 3, and p = .513 (> p = .05). Hence, hypothesis 22 was rejected, and the null hypothesis 22.1 was accepted. There was no significant relationship between learners' management and the numbers of the asynchronous distance classes which the participants had taken. The numbers of the asynchronous classes which the participants had taken did not affect the participant's choice on the level of importance given to the learners' management. Moreover, for the technology knowledge of the learner in hypothesis 23, the Chi-Square value = 10.514, *df* = 3, and p = .015 (≦ p = .05). Hence, hypothesis 23 was accepted, and the null hypothesis 23.1 was rejected. Also, this meant that the technology knowledge of the learner had a significant difference with the numbers of the asynchronous classes which the participants had taken. The numbers of the asynchronous classes which the participants had taken affected the participant's choice on the level of importance given to the technology knowledge of the learner. Finally, by examining the quality of the system and Internet for hypothesis 24, the Chi-Square value = 7.457, *df* = 3, and p = .059 (> p = .05). Therefore, hypothesis 24 was rejected, and the null hypothesis 24.1 was accepted. The

finding also indicated that there was no significant relationship between the quality of the system and Internet, and the numbers of the asynchronous classes which the participants had taken. The numbers of the asynchronous classes which the participants had taken did not affect the participant's choice on the level of importance given to the quality of the system and Internet.

Table 13

The Summary of the Results of Hypothesis

Hypothesis	Stat. Test	p	Result
Hypothesis 1: There is a significant relationship between major elements and gender at p ≦ .05 level of significance	Chi-Square	.084	Reject
Hypothesis 2: There is a significant relationship between abundant material design and gender at p ≦ .05 level of significance.	Chi-Square	.868	Reject
Hypothesis 3: There is a significant relationship between the strategies of course activities and gender at p ≦ .05 level of significance.	Chi-Square	.506	Reject
Hypothesis 4: There is a significant relationship between learners' management and gender at p ≦ .05 level of significance	Chi-Square	.003*	Accept
Hypothesis 5: There is a significant relationship between the technology knowledge of the learner and gender at p ≦ .05 level of significance.	Chi-Square	.059	Reject
Hypothesis 6: There is a significant relationship between the quality of the system, and Internet and gender at p ≦ .05 level of significance.	Chi-Square	.145	Reject
Hypothesis 7: There is a significant relationship between the major elements and age at p ≦ .05 level of significance.	Chi-Square	.006*	Accept
Hypothesis 8: There is a significant relationship between abundant material design and age at p ≦ .05 level of significance.	Chi-Square	.028*	Accept
Hypothesis 9: There is a significant relationship between the strategies of course activities and age at p ≦ .05 level of significance.	Chi-Square	.071	Reject
Hypothesis 10: There is a significant relationship between learner's management and age at p ≦ .05 level of significance.	Chi-Square	.005*	Accept
Hypothesis 11: There is a significant relationship between the technology knowledge of the learner and age at p ≦ .05 level of significance	Chi-Square	0*	Accept
Hypothesis 12: There is a significant relationship between the quality of the system and Internet and age at p ≦ .05 level of significance	Chi-Square	.432	Reject
Hypothesis 13: There is a significant relationship between major elements and grade at p ≦ .05 level of	Chi-Square	.017*	Accept

significance			
Hypothesis 14: There is a significant relationship between abundant material design and grade at p ≦ .05 level of significance	Chi-Square	.862	Reject
Hypothesis 15: There is a significant relationship between the strategies of course activities and grade at p ≦ .05 level of significance	Chi-Square	.492	Reject
Hypothesis 16: There is a significant relationship between learners' management and grade at p ≦ .05 level of significance	Chi-Square	.104	Reject
Hypothesis 17: There is a significant relationship between the technology knowledge of the learner and grade at p ≦ .05 level of significance.	Chi-Square	.025*	Accept
Hypothesis 18: There is a significant relationship between the quality of the system and Internet and grade at p ≦ .05 level of significance	Chi-Square	.08	Reject
Hypothesis 19: There is a significant relationship between major elements and the numbers of the asynchronous distance classes which the participants took before at p ≦ .05 level of significance	Chi-Square	.036*	Accept
Hypothesis 20: There is a significant relationship between abundant material design and the numbers of the asynchronous distance classes which the participants took before at p ≦ .05 level of significance.	Chi-Square	.16	Reject
Hypothesis 21: There is a significant relationship between the strategies of course activities and the numbers of the asynchronous distance classes which the participants took before at p ≦ .05 level of significance.	Chi-Square	.171	Reject
Hypothesis 22: There is a significant relationship between learners' management and the numbers of the asynchronous distance classes which the participants took before at p ≦ .05 level of significance.	Chi-Square	.513	Reject
Hypothesis 23: There is a significant relationship between the technology knowledge of the learner and the numbers of the asynchronous distance classes which the participants took before at p ≦ .05 level of significance.	Chi-Square	.015*	Accept
Hypothesis 24: There is a significant relationship between the quality of the system, and Internet and the numbers of the asynchronous distance classes	Chi-Square	.059	Reject

which the participants took before at $p \leqq .05$ level of significance.

Discussion of the Findings

There were several major findings in this study. The first one was that the participants thought that the quality of the system and Internet was the most important element of these five major elements. According to Hong' study (1999), the quality and the speed of Internet was the major issue that affected students learning via CMS based asynchronous instruction (Hong, 1999; Lin, & Chen, 2001). Also, in Liang's research (2001), the result indicated that in Taiwan, it was not cheap to use the Internet. Hence, the quality of the system and Internet, and the cost became a big concern for distance learners. Therefore, the finding was consistent with the literature reviews, and also these findings could provide further support to existing studies. Hence, the instructors should pay more attention in the quality of the system and Internet when they design asynchronous courses using a CMS.

Secondly, the result also indicated that the three demographic variables had significant relationships with the entire major learning material elements, and only the gender variables had no significant relationship with the entire major learning material elements. The finding also meant that the demographic variables of the participants affected how they feel about the distance class, and how they approach the asynchronous instruction, except the gender variable. Hence, when the Taiwanese instructors design the asynchronous instruction, they need to take the demographic background of students into consideration.

Moreover, the findings specifically indicated that learners' management had a significant relationship with gender. This meant that the gender difference of the students affected learners' management. Hence, when the Taiwanese instructor designed learners' management of the learning material elements in the asynchronous instruction, they need to pay attention that gender is a significant factor and to take these differences into consideration and to create different approaches accordingly. In addition, the findings also pointed that the age difference affected the choice of the Taiwanese students

toward learners' management, abundant material design, and the technology knowledge of the learner. Moreover, the results showed that the years in school difference and the numbers of the asynchronous classes which the participants had taken affected the selection of the technology knowledge of the learner. Therefore, when Taiwanese asynchronous instructors design the classes, they need to pay attention to the years in school difference and the numbers of the asynchronous classes which the participants had taken in order to design suitable classes for the students.

Implication for Practice

According to the findings, Taiwanese students thought that the quality of the system and Internet was the most important element in CMS based asynchronous instruction. The rank from high to low were the technology knowledge of the learner, abundant material design, learners' management, and the strategies of the course activities. Hence, when Taiwanese instructors design asynchronous classes, they need to consider the quality of the system and Internet, and then the technology knowledge of the learner followed by abundant material design, learners' management, and the strategies of the course activities. Therefore, the findings provided useful information for the instructors and schools in designing asynchronous instruction. By this information, the schools know that maintaining the quality of the system and Internet is the most important thing in developing asynchronous instruction. Then, for instructors, they know that maintaining the quality of the system and Internet is important for motivating students in asynchronous learning. Also, the instructors know that when they design the classes, what is most important to the students taking the classes is what the class design should focus on in order to create a more effective learning environment.

In addition, the findings also indicated that the demographic variables affecting the Taiwanese students selected the major learning material elements, except gender. Hence, the instructors will design the suitable asynchronous

classes according to different age, years in school, and the numbers of the asynchronous classes which the participants had taken. This also helps instructors and the schools to save time and money in designing effective asynchronous instruction because they knew what elements are important, and what factors influence the classes. Therefore, the findings are useful and practical for Taiwanese education institutions in designing asynchronous instruction.

Recommendations for Future Study

First, in this study, the returning rate was only 72.95%, and the researcher only selected six schools which were closest to Taipei. If future studies could increase the numbers of participants and enlarge the numbers and the locations of the schools, the finding of the study will be more useful. Secondly, future studies can increase the numbers of the major learning material elements, and by adding other elements to the study, it will help to promote more in-depth learning by providing additional information. Thirdly, this study focused on the opinions of students. However, if future studies can bring in the opinions of instructors, the information will be richer. Moreover, future researchers can add more demographic backgrounds into the study in order to increase the demographic variables that can be taken into consideration when analyzing the data. Overall, this study is the foundation of the asynchronous instruction. In the future, researchers can use this as a basis in order to develop more specific or in-depth studies for the future.

Conclusion

Designing asynchronous instruction is hard work for Taiwanese instructors and schools. It costs a lot of money and time, but it is also hard to know if the class design will be suitable for students. Because of this, developing of the asynchronous instruction in Taiwan can be obstructed and class design not maximizing learning in an asynchronous class setting. By this study, the findings provided useful and practical information to help instructors in designing classes for the CMS. The findings indicated that the

quality of the system and Internet was the first concern and the most important element for students in asynchronous learning. Then, the results also pointed out that age, grade, and the number of the asynchronous classes which the participants took before affected participants in selecting the major elements in the CMS based asynchronous instruction. Hence, the instructors should pay attention in these demographic variables when they try to design the classes. Therefore, by this study, the findings help many Taiwanese schools and instructors to save time and money in designing asynchronous instruction. Finally, the study provided useful and practical information to help Taiwanese education institutions to develop more effective asynchronous instruction classes by using a content management system.

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