

國立交通大學

資訊科學與工程研究所

碩士論文

一個基於社群網站的線上課輔系統

A Social Network Based Online Tutoring System

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中華民國 101 年 6 月

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摘要

線上課輔是為提升學習效果，當學生在日常課程學習中有諸多不懂或是進度落後時，透過線上課輔系統，與課輔老師互動討論後，能夠解決在學習上的困難及提升解決問題的能力。目前大部分課輔系統進行課輔活動時都是使用需要購買授權的同步即時互動教學系統，因此我們想要利用可免費使用的替代軟體來進行課輔。我們發現到社群網站之所以受歡迎，是因為社群網站所提供的服務越來越多樣化，所以我們擬將線上課輔系統結合社群網站的功能，透過此線上課輔系統來觀察是否能夠提升學生的學習興趣和學習效果。

Google+ Hangouts 提供眾多功能，很適合進行線上課輔的活動，它是可以免費使用。不用考慮需要購買授權的問題。進行課輔的老師與學生，一來可以不侷限在學校裡面做線上課輔活動，在有電腦與相關設備的地方(例如家裡)作課輔教學，二來課輔教師與學生可以利用除了上課時段之外的時段進行討論。因此本論文擬將線上課輔系統結合社群網站 Google+ Hangouts 視訊聚會功能，開發出一個基於社群網站的線上課輔系統。

A Social Network Based Online Tutoring System

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Abstract

The utility of the online tutoring system is to enhance the learning effect. When students do not understand or behind schedule in the ordinary course, through online tutoring system to interact with tutors that can solve their problems and enhance student's problem-solving skills. Currently, most of online tutoring systems are used authorized real-time interactive teaching system to online tuition. We want to use free substitute software for the authorized system. We found that social network sites which provide a variety of functions, so we want to integrate feature of social network site to our online tutoring system. We would like to know whether it can enhance students' interest and learning effect or not.

Google+ hangouts provides vary functions, it is suitable to be used on online tutoring activities. It is free to use, and do not need to consider the authorized problem. This system could let tutors and students do online tutoring activities anywhere, not limited at school computer lab. Tutors and students also could discuss problems or school work anytime. In this thesis, we will integrate Google+ Hangouts feature to our online tutoring system, and propose a Social Network based online tutoring system.

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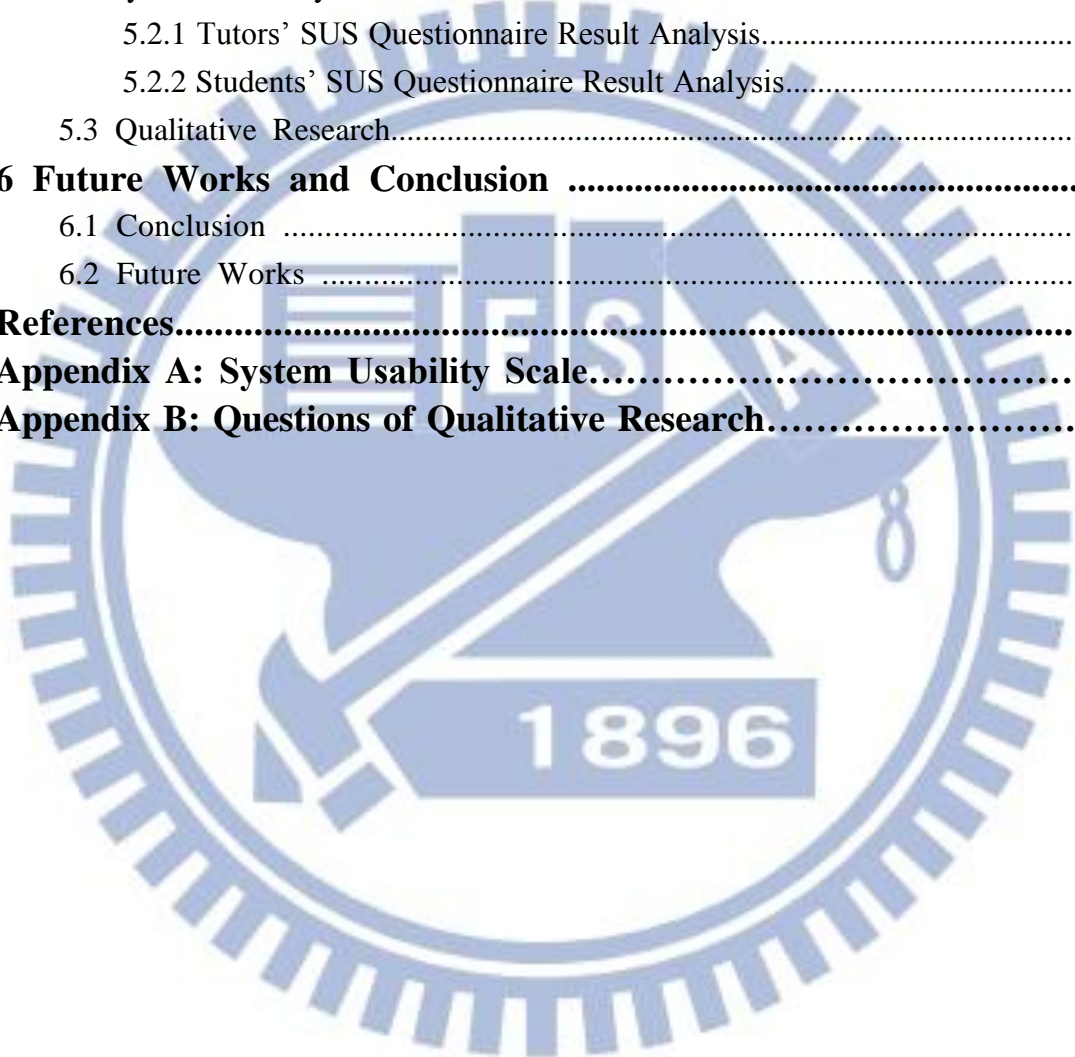
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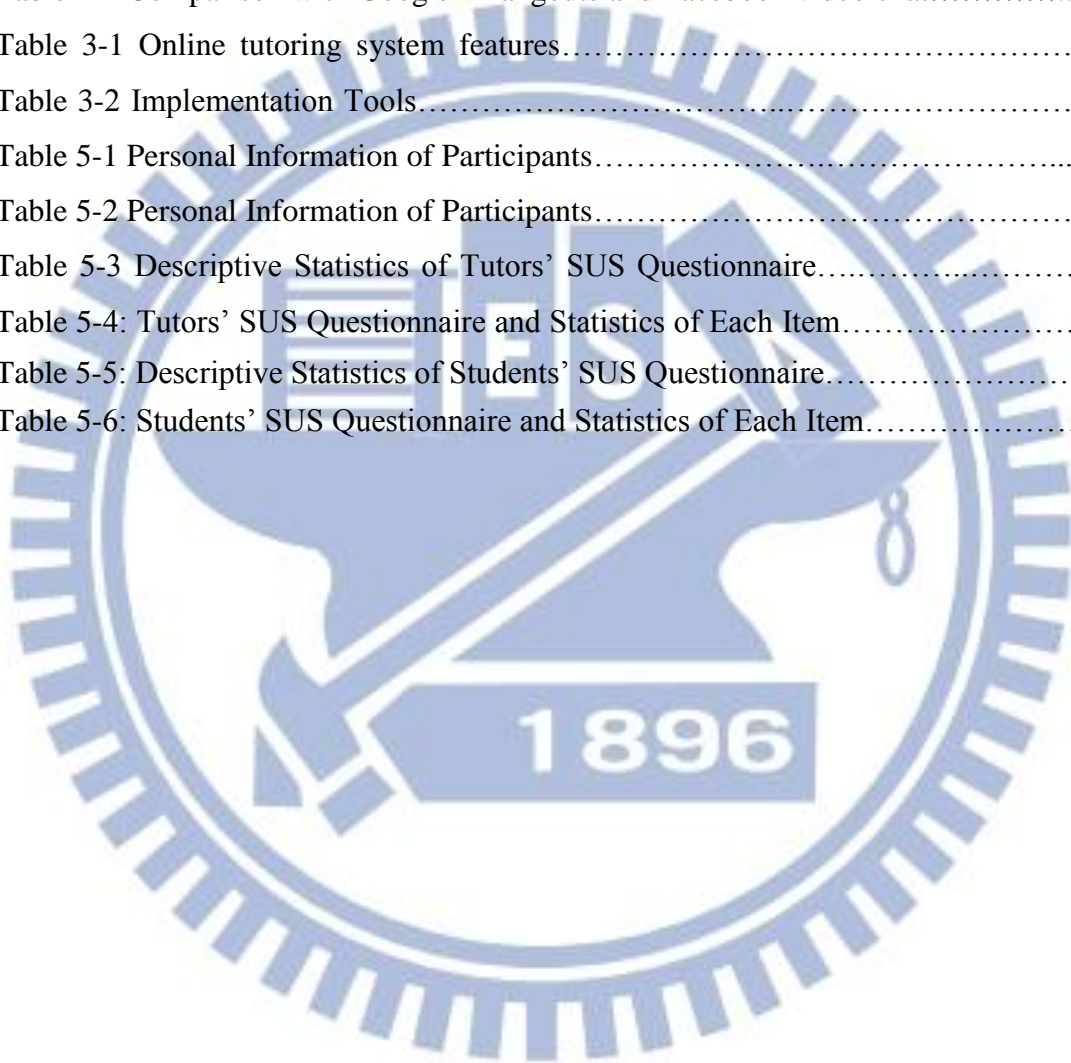


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1 Introduction

1.1 Preface

Today Internet has become an indispensable part of our life. Many people use Internet to communicate to each other. With the Internet and computers, education is no longer limited to the traditional classroom. Educational model has gradually been transferred to online learning. Online learning and teaching is becoming a necessity in our future. Some researchers point out that online education can be at least as effective as conventional instruction [1] [2].

Some students have learning backwardness problems. The teachers at school should play their effective role in discovering the backwardness and giving remedies [3][4]. Many schools have tutoring activities for after school learning. Tutoring usually refers to the act of a teacher or instructor (called a tutor) helping a person learns something about a subject. Most commonly, it refers to the relationship between a private teacher/instructor helping a student with school work. Online tutoring is a better way for a student to receive help [5]. It uses a combination of computer-mediated conferencing. Students could discuss problems with their tutor through the Internet, do not need to see each other actually [6]. Tutors could use different way to teach students in online tutoring [7].

Online tutoring is also appropriate for distance education [8][9]. Distance education focus on student-centered learning and the learning objects able to autonomous learning [10][11]. It can instruct great numbers of students at the same time. Some schools in remote districts that they have computers and related equipments, but they lack of teachers and funds. Students in remote

districts that most come from disadvantaged families and their economic conditions are not well. These students have not been able to autonomous learning completely. In the environment, the education quality and learning ability can not balance with the urban schools [12]. So they need online tutoring. Construct an online tutoring system and hire volunteers or undergraduate students or graduate students as tutors. These tutors must have a high standard of academic literacy. Design the teaching methods and materials, through one-to-one tutoring to improve the learning backwardness problems [13].

Many schools have joined the online tutoring project for after school's learning [14]. This project was originally initiated by the Ministry of Education. College students tutored junior high students and primary school students in remote districts by Internet teaching. Enhance the learning effectiveness of students in remote districts and promote the equalization of learning opportunities [15][16]. These schools almost use the JoinNet [17] software to online tutoring. JoinNet is the multimedia communication client software developed by HomeMeeting. It has many features and it is very suitable to use by online tutoring, but it is required to pay for a license. Only schools will pay for the license when they need to use JoinNet software to online tutoring. General users or some schools may not afford to pay the fee of license, but they need and want online tutoring. So we would like to use free software to online tutoring.

1.2 Motivation

We expect to let more people could use online tutoring system, so we want to find some free software to be used in our system. Nowadays, social networking sites are very popular. The usage of social networking sites is more and more. Social networking site such as Facebook[18], Google+[19], providing vary functions to users. They provide messenger that users may chat

with their friends on a one-to-one basis, or a user may chat with multiple friends simultaneously through the groups feature. User's homepage shows information that includes profile changes, upcoming events, and other updates, and it also shows conversations taking place between the walls of a user's friends. In addition, Google+ has a feature different with Facebook, that is the Hangouts function. Hangouts are places used to facilitate group video chat. Facebook also has video chat, but it only one-to-one chat and it can not do other operations. Hangouts feature is different, it has video communication and allows users to share documents, share a scratchpad and share their screens with other users. It's free and convenience to use.

We want to integrate the Hangouts to our online tutoring system. There is the first time to use Hangouts on online tutoring. Tutors could communicate with their students more easily and conveniently. The past online tutoring way is that tutors and students who gather in their school's computer lab in the same time are teaching and learning but if use the Google+ Hangouts, it could let tutors and students online tutoring anywhere. Google+ Hangouts also support mobile user. Users only need a computer with Internet or 3G mobile phone then could start tutoring. It is not limited in the school's computer lab to online tutoring. Two parties do not need to stay in school, maybe it is a good way to them. But it also has some problems we face and should to control. This new tutoring way has many advantages, such as tutors and students could communicate with each other more effortlessly and frequently. It offers more opportunities that they could discuss problems in learning or school work. Students could ask their tutor questions directly or log on Google+ then leave some messages to their tutor instead of stay these questions and wait the next tutoring time to ask. Tutors could know well their student's situation.

1.3 Objectives

We want to provide an online tutoring system which integrated social networking site features that could support collaborative teaching and learning. By integrated social networking site features which could enhance learner's interest and help the two parties interacting with each other immediately. Our teaching strategy is one-to-one tutoring; the tutor could concentrate on teaching his/her students.

We also intend to create a simple, convenient and user-friendly interface of our online tutoring system, not having complicated steps and difficult to use. In our online tutoring system, we provide many features to users, like usual e-learning websites. We expect that our online tutoring system could enhance students' learning performance and train students' ability to solve problems. We also expect that we can provide a practical platform to tutors, they could teaching more conveniently and know students' learning situation and interact with student more easily.

1.4 Outline of the thesis

This dissertation is divided into six chapters. The following is a brief description of the content of each other:

In chapter 2, we discuss the background of online tutoring system and the related work. In chapter 3, we show a diagram of system overview, introduce features in our online tutoring system and describe implementation details. Next, in chapter 4 presents the flow of online tutoring operations. The system evaluation is in chapter 5 containing the questionnaire analysis. Finally, the conclusion and future works for our proposed module are presented in chapter 6.

2 Backgrounds

2.1 Google+

Google+ (sometimes abbreviated as G+) is a social networking service, operated by Google Inc. The service launched on June 28, 2011. Google+ integrates across a number of Google social services such as Google Profiles, Mail and introduces new services identified as Circles, Hangouts and Sparks. Google+ is available as a website and on mobile devices. Google+ is about having great conversations. Share photos, videos, links, or anything else that's on your mind.

2.1.1 Features of Google+

- “Circles”

This feature enables users to organize people into groups for sharing across various Google products and services. Circles make it easy to share the right things with the right people, just like in real life.

- “Hangouts”

Hangouts are places used to facilitate group video chat with up to 10 people participating in a single Hangout. It also supports mobile users.

- “Messenger”

This feature let users can bring groups of friends together into a simple group chat, putting everyone on the same page.

- “Sparks”

This feature is a front-end to Google Search, enabling users to identify topics they might be interested in sharing with others.

- “Search”

This feature allows users to search for content within Google+. Users type what they’re looking for into the Google+ search box, and Google will return relevant people and posts, as well as popular content from around the web.

- “Pages”

Pages are available to everyone. Users can create public pages for brands, products, local businesses and more.

2.2 Google+ Hangouts

Hangout is meant a place where someone spends a lot of time or where they live. Google+ Hangouts is the video chatting service available on Google+. You can use this to chat with friends or everyone is not always around their computers. It’s free to use. To use hangouts, users need a google account first. Only Google+ users are able to use this hangouts feature. We use Google Hangouts to do online tutoring activities in our system.

2.2.1 How to getting started with Hangouts

Before we want to start a hangout, something we must be to know. The following are some requirements.

1. Check out the system requirements(Table 2.1) to make sure you’re using a supported browser and operating system, and that your processor and bandwidth are sufficient.
2. Download and install the latest version of the Google voice and video plugin [20].

3. Make sure that your webcam is working.

4. Suppose to use a headset. Headphones with a built in microphone will dramatically improve your Hangout experience. The hangout settings page can help users to confirm that user's computer is set up and ready to use.

Table 2-1 system requirements for Hangouts

Supported Browsers:	<ul style="list-style-type: none">■ Google Chrome 10+■ Microsoft Internet Explorer (IE) 8+■ Mozilla Firefox 3+■ Safari 4+
Supported Operating systems:	<ul style="list-style-type: none">■ Mac OS X 10.5+■ Windows 7■ Windows Vista with SP1 or later■ Windows XP■ Chrome■ Ubuntu and other Debian based Linux distributions
Processor Minimum Requirements:	Any 2 Ghz dual core processor or greater
Bandwidth	<ul style="list-style-type: none">■ For 1:1 connections we suggest a 900kbps (up/down)■ For group video connectivity we suggest 900kbps/1800kbps (up/down)

2.2.2 Limit of Hangouts

There limitation of Hangouts is that maximum ten participants when in the Hangout. In other words, a tutor teaches nine students at the same time at most.

2.2.3 Features of Hangouts

The following is a list of the google+ hangout features:

- “Screen Share”

Users could share their screen to others. This feature could be used in when tutor want to teach something step by step. And then student could know about the correct operation.

- “Text record”

All notes typed in hangout document are recorded in user’s google document. When the hangout finished, users could keep all notes and review these notes in users’ google document.

- “Draw record”

Users draw something or wrote some equations in sketchpad. These writings are recorded in users’ google document. When the hangout finished, users could keep all writings and review these writings in users’ google document.

- “Google Doc integration”

The files which were uploaded to users’ google document could be uploaded in hangouts and shared to others. When these files in hangouts were modified, the files in users’ google document were updated immediately.

- “Group Chat”

Group chat can let users chat with each other by type words.

- Invite a phone participant to hangout.

Why did we choose Hangouts and didn't choose facebook chat? The following table is a comparison with Google+ Hangouts and Facebook chat.

Table 2-2 Comparison with Google+ Hangouts and Facebook video chat

	Facebook Video Chat	Google+ Hangouts
Whiteboard	no	yes
Text chat	yes (another window)	yes
Text Record	no	yes
Recording	no	yes
Screen share	no	yes
Collaborative browsing	no	yes
Upload files	no	yes
Participant	2(one-to-one)	Max. of 10 (one-to-one or one-to-many)
Price	free	free

From the Table2-2, we could understand that Facebook chat is not suitable to be use in online tutoring. Because Facebook only provides video communication, it can not upload course materials or write something.

2.2.4 API of Google+ Hangouts

The Hangouts API enables users to develop collaborative apps that run inside of a Google+ Hangout. We could write Hangout apps using standard HTML, JavaScript, and CSS. The Hangout APIs consist of three important aspects: Gadget XML, Application state, and Events.

2.3 Related Works

In the sections, we will introduce some researches about online tutoring. Such as interaction of tutors and students, web sources are learning materials, students' learning attitude and learning performance.

In order to understand the other's online tutoring system with our differences, the last section we will introduce the after-school Internet tutoring program which promoted by the Ministry of Education.

2.3.1 Online tutoring

■ Interaction

Moore (1989) [21] discusses three types of interaction essential in distance education. Those are learner-content, learner-instructor, and learner-learner interactions. In learner-content interaction the student interacts with the course materials. The learner gains and constructs knowledge by working with the subject matter. Careful selection of materials and activities for online tutoring will help learners achieve course objectives. Learner-instructor interaction involves direct communication between the learner and the instructor. The instructor assesses students'

comprehension or progress with the content. Carefully select communication technologies to enable and increase interaction and collaboration among learners. The learner-learner interaction is the exchange of information, ideas, and dialogue that occur between students about the course. Hillman, Hills, and Gunawardena (1994) [22] have taken the idea of interaction a step farther and added a fourth component to the model learner-interface interaction. This means that the learner must understand not only the procedures of working with the interface, but also the reasons why these procedures obtain results. Furthermore, Kearsley states that “a high level of interaction is desirable and positively affects the effectiveness of any distance education course (Kearsley, 1995)[23].

■ Resources

There are plentiful resources on the internet. These online resources may be able to used in teaching or be a part of learning through instructional design [24]. Lisa Dawley introduced many tools for online teaching. These tools are Audio/Video Conferencing and Whiteboard, Chat and Instant Messaging, Discussion Forums and etc. The strengths and weaknesses of each tool are discussed in detail. Make the best use of these tools; it will improve the effect of online teaching [25].

■ Learning attitude

Utilizing on-line-tutoring system students not only has developed the ability to propose their own ideas, but also has shown willing to participate activity in the discussion. Even when unable to use on-line tutoring due to external factors, students also are not willing to give up the learning opportunity [26]. Students hold positive attitudes toward e-teaching after school [27].

■ Learning performance

The study found that if the students had more internet experience, they would have better performance and learning satisfaction, and were more willing to study in the web-based environment [28]. If students like Internet learning then their learning performance must be better than some students are passive learning.

2.3.2 After-School Internet Tutoring Program

This After-School Internet Tutoring Program has been promoted by the Ministry of Education for six years. The Ministry of Education commissioned the National Chi Nan University in 2006 to establish the “After-School Internet Tutoring Platform” that provides those students in remote districts with “one-to-one” or “one-to-many” tutoring service through the Internet. Many college students participate in this program and serve as tutors. These college students who gathered in the computer lab were tutoring with students in remote districts. On the other side, students in remote districts who also gathered in the computer lab were online learning with their tutors. Why they need to gather in the school computer lab? Because some students in remote districts who have no computer or no Internet connection. Moreover, this way is good for managing students and tutors.

Before online tutoring, they need to make sure that webcam and handset are working. Sometimes it needs to adjust the volume levels in audio files. And then, they need to install JoinNet software. They used JoinNet software to online tutoring. Tutors enter the classroom ahead; students need to know their classroom number and then enter the correct classroom. Both of them should familiar

with the features of this tutoring platform (Figure 2-1). Tutors use the tools of the classroom to teaching their students.

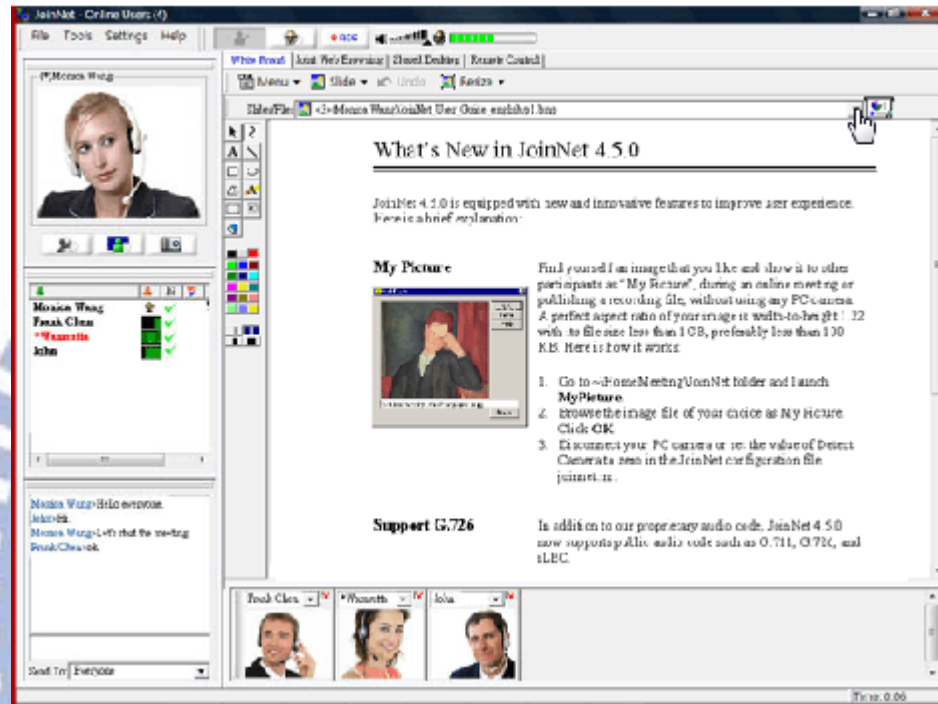


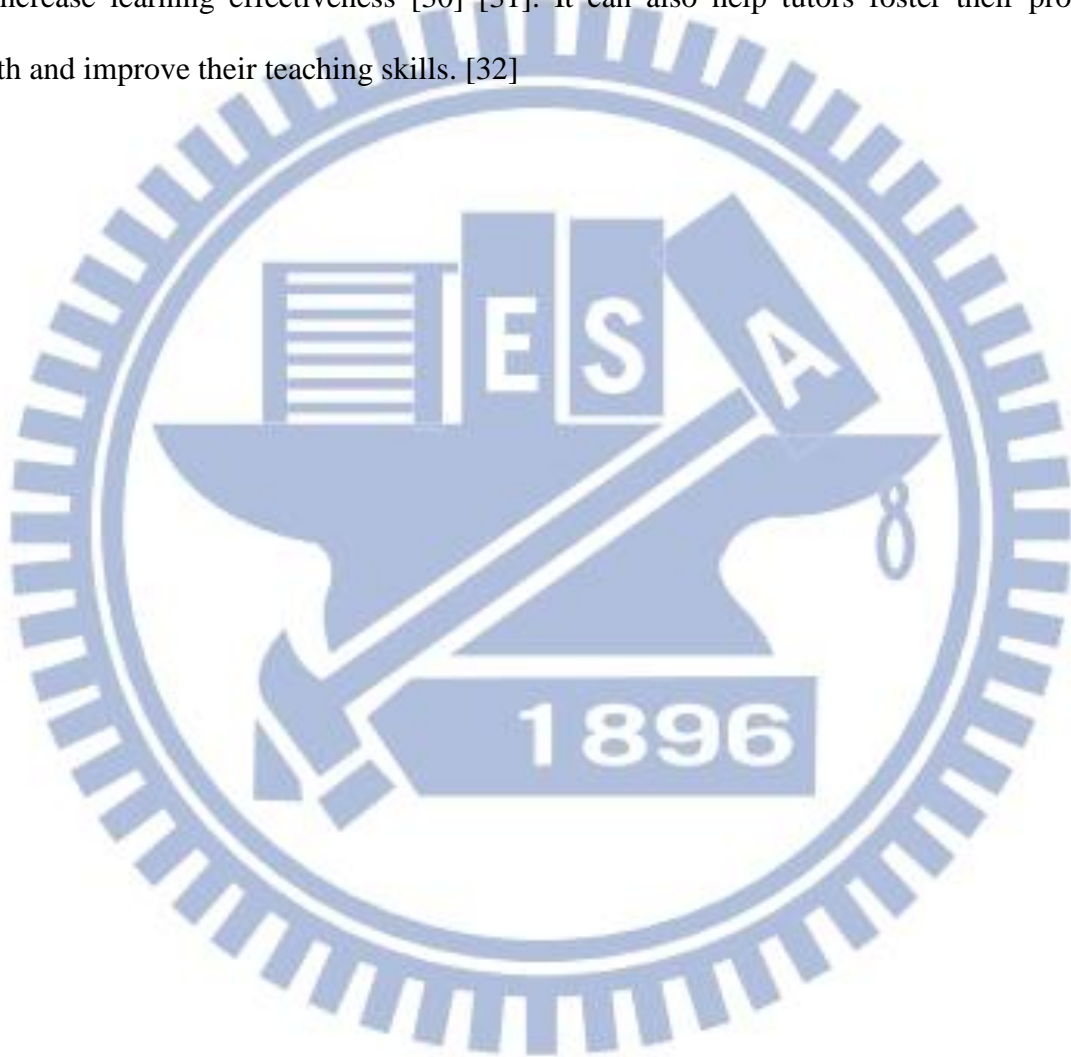
Figure 2-1 JoinNet software

The tutoring platform has many features, such as: whiteboard, surf the Web together, shared desktop, distance remote, chat box, recording, and audio and video communication, and so on. JointNet allows the tutor to see and talk to any number of students simultaneously. [29]

When they are beginning to online tutoring, they must have some problems as suddenly more people use JoinNet that cause system instability, tutors and students spend many time to check other status. If the system instability, students maybe can not hear tutors' voice. Tutors reduce the Internet bandwidth, and then students can hear what do tutors say and see the course materials.

Tutors' seat can not set closely in school computer lab, because microphones receive others sound. This may let students confused and reduce the quality of teaching.

The implementation effectiveness of this project is ensures that could enhance students' interest and increase learning effectiveness [30] [31]. It can also help tutors foster their professional growth and improve their teaching skills. [32]



3 System Design and Implementation

3.1 Online Tutoring System

3.1.1 Overview

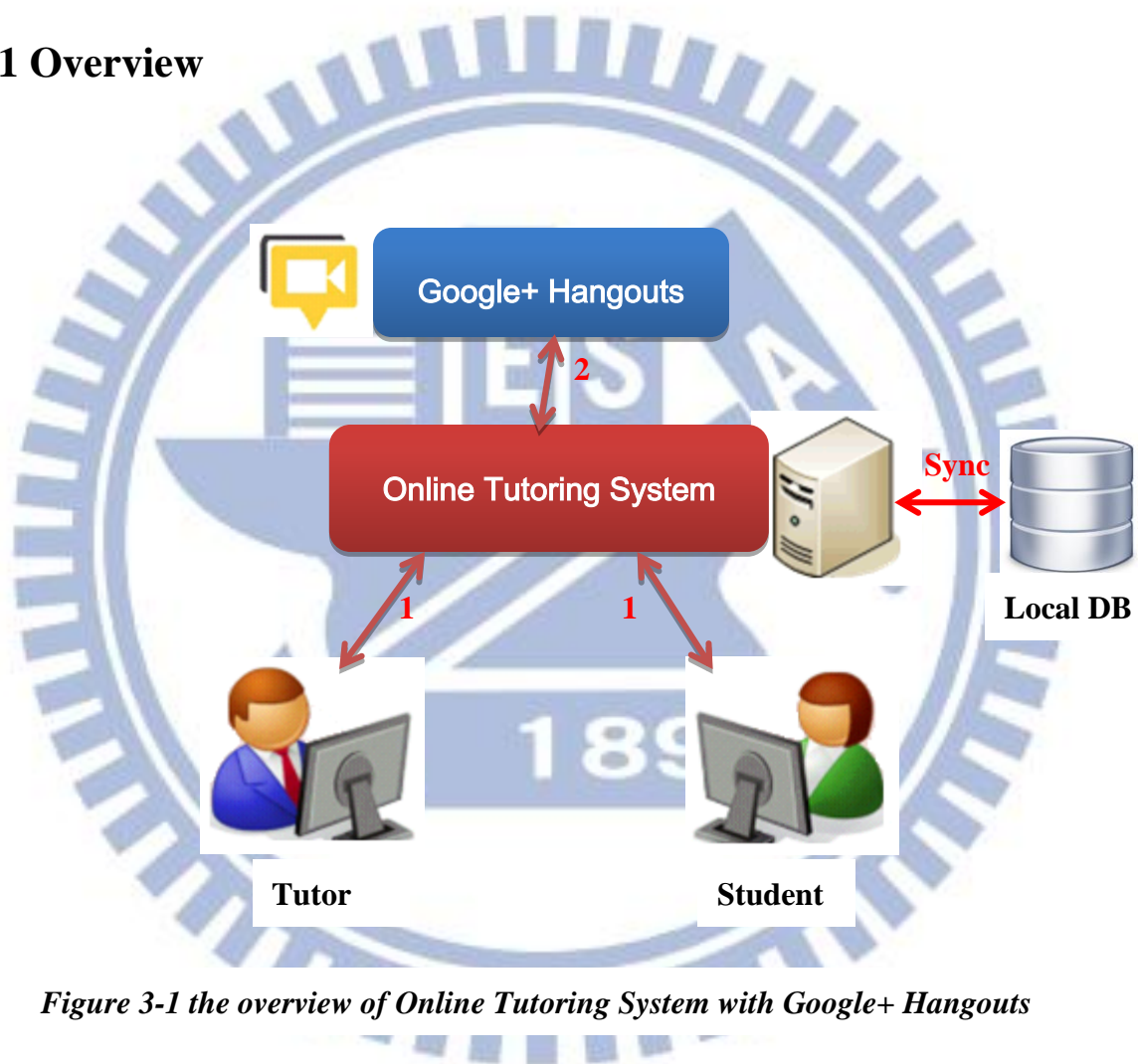


Figure 3-1 the overview of Online Tutoring System with Google+ Hangouts

The first part we proposed in this thesis is named “Online Tutoring System”. The Online Tutoring System is mainly designed for collaborative teaching and learning. Figure 3-1 depicts the overview of Online Tutoring System with Google+ Hangouts.

This system process is as follows:

Step1:

When users who would like to use this online tutoring system need to register an account. Only the first time needed. Tutors and students need to login to this online tutoring system simply enter their username and password. When they already login, they have rights to use the online tutoring system.

Step 2:

When tutors and students prepare to online tutoring, they link to online tutoring page, click the start class button and then system will connect them to google+ hangout page. Our online tutoring system used Google+ Hangouts to online tutoring.

Sync:

After two parties log in our online tutoring system, their data, course materials, and discuss content are stored in local database(MySQL). Administrator can manage those data.

3.1.2 Role

In our online tutoring system, we have four roles. One is tutor; others are student, class teacher and system administrator. Figure 3-2 shows the roles of online tutoring system.

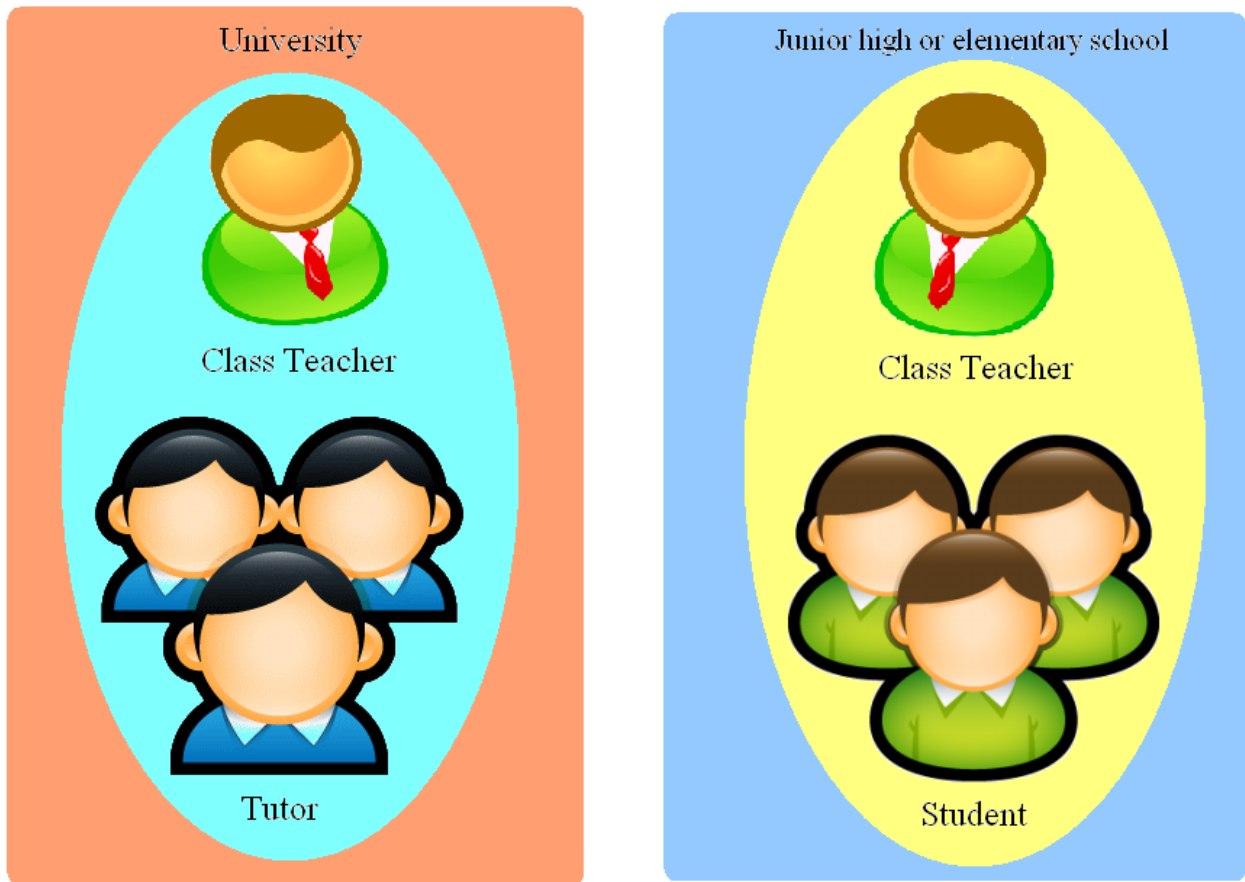


Figure 3-2 the roles of Online Tutoring System

■ Tutor

We hire undergraduate or postgraduate students to be tutor. Require them to prepare course materials for student. Our tutors have positive attitude and like to help student to solve problems. Tutors help students figure out the answer on their own and use the tools of the classroom to share resources, explain complicated diagrams and review papers together. We also hope tutors could improve students' learning attitude. Make them know that learning is a best thing.

- Student

Usually choose junior high school or elementary school students who need to be tutored.

Teachers in school pick up some students to be online tutoring objects. Some of them may have learning backwardness problems, or volunteer to take online tutoring courses.

- Class teacher

School teacher as a priority to be served. There should be one class teacher in the tutor's portion or student's portion. Class teachers most know what the students think and their behavior.

Class teachers deal with situations which have suddenly happened. Such as today's courses were suspended, they need to contact students and notify them. Or students always cannot pay attention to learning, class teachers should correct students.

- System administrator

Maintain the system data and features. If needed, the system administrator will improve or add system features. We also construct a feature which will contact the system administrator in our online tutoring system, if users have troubles, they could fill out the form in the contact us page, and then the system administrator will solve the problems.

3.1.3 System Architecture

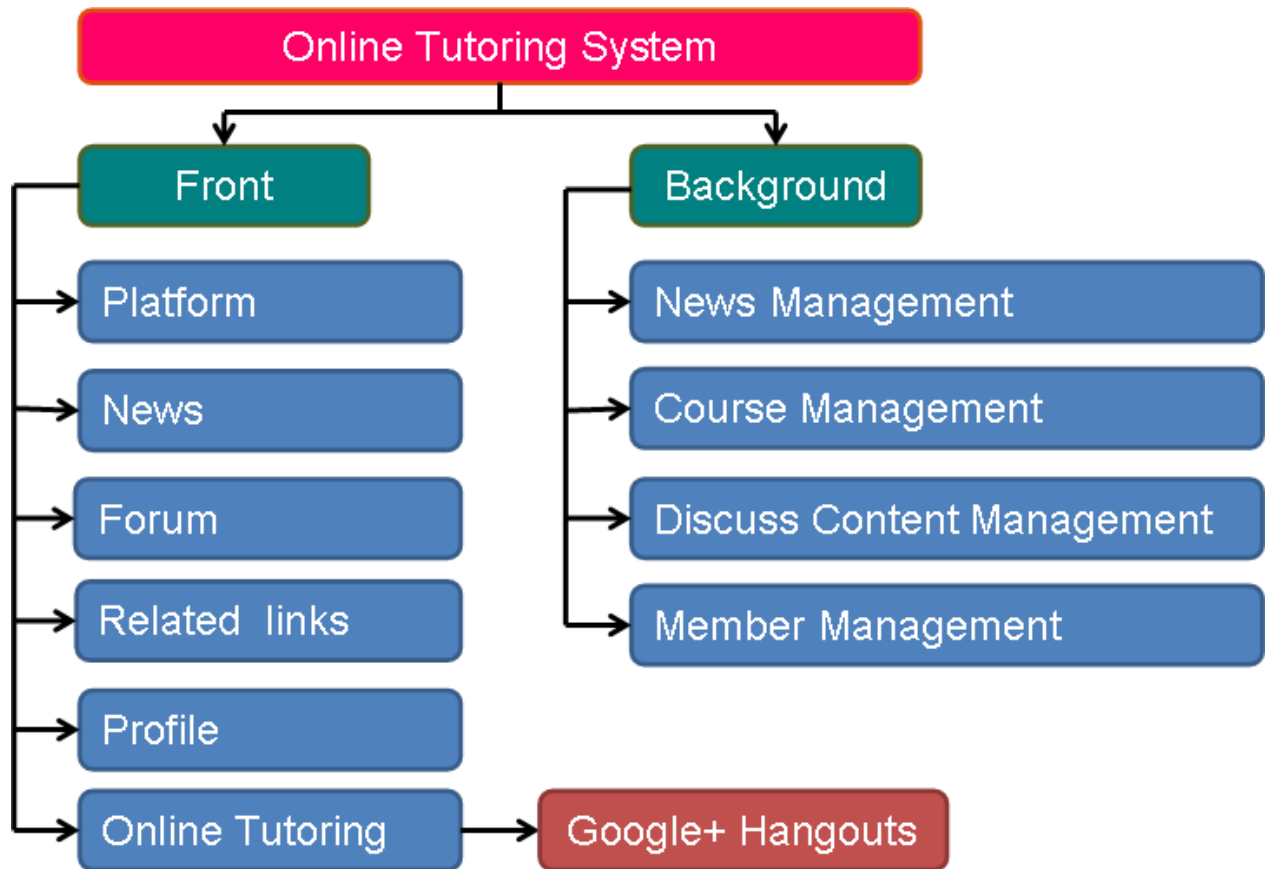


Figure 3-3 System Architecture of Online Tutoring System

Figure3-3 is system architecture of our online tutoring system. We construct a system and design some features that tutors and students could use. And their course materials, discuss content, member information will recorded into our database.

Figure3-4 is our online tutoring system interface. Table 3-1 is a list of system functions in our online tutoring system. Tutor's usage rights is different to student's usage rights.



Figure 3-4 interface of Online Tutoring System

We construct a user-friendly interface. The major features are set in the navigation bar. Minor features set in separate pages. Each page we have operate instructions, let users could easy to use in our system.

Table 3-1 online tutoring system features

Features	Illustration
Latest news	View the latest news.
Online tutoring	<p>Here includes some teaching-related items.</p> <ul style="list-style-type: none"> ※Online tutoring: System connects a student to a tutor for a one-to-one collaborative learning experience in secure online classroom. ※Course syllabus: Tutors write outline and summary of topics in this course. Students could understand the scheduled of this course. ※Course material: Tutors upload course materials that they used to teach. Students could download course materials to preview and review. ※Teaching journal: Tutors need to write the journal that record teaching

	process and student's learning situation on the day.
Forum	Provide two forums to users ※Tutors forum: It is a place for tutors to discuss about teaching and course materials. Only tutors could use. ※Students forum: Students could discuss something which might be homework problems or some learning problems here. Tutors could solve their problems.
Related Links	Provide a lot of related links to users. All links are related to learn.
Personal profile	Users could modify their profiles and change password.
Contact us	If users have some technical problems, they could fill out the form to us. System administrator could solve their problems.
Sitemap	Users could see a list of pages of online tutoring system accessible to users. This helps users find pages on the site.

最新消息		
發布日期	類別	標題
2012-05-02 20:39:07	其他	齊研英語詞匯：高效記憶須掌握的三大原則
2012-05-02 20:16:16	其他	關懷偏鄉童軍 軍備局官兵愛心贈書
2012-05-02 19:10:38	活動	多益聽金計畫 徵求公益青年
2012-04-30 18:31:17	其他	星巴克「原住星希望」活動開跑
2012-04-23 20:28:47	其他	志工當嚮導 家長體驗檢據
2012-04-23 20:06:03	活動	7月8日將舉辦「2012大專英語口譯能力聯合校際賽」，早鳥優惠期間為4/23-5/16。
2012-04-22 20:32:53	其他	慈濟贈書包 假日學童好開心
2012-04-17 20:24:55	其他	總輔導近學童 六經主管擔任老師
2012-03-02 20:05:00	其他	上免費總輔導 來二手書店
2012-01-23 20:47:40	更新	學習是永無止境

Figure 3-5 Latest News feature

We posted some news which related to learning and teaching. If our tutoring activities have some changed, we also post in news area.

線上課輔

課程大綱

課程教材

課輔日誌

本教學平台利用Google+ Hangouts 進行視訊教學



[點此開始上課](#)

下課後請簽退，下方按鈕按一次即可，系統會紀錄簽退時間，謝謝您

[請簽退](#)

[線上課輔使用教學影片](#)

操作說明

1. 點擊按鈕後會進入你的Google+，開啟一個視訊聚會，限制分享給你的課輔老師/學生，即可進行一對一教學。
2. 老師端導向Google+ Hangouts畫面，學生端則導向Google+畫面，等待老師開好視訊聚會後點選加入聚會。
3. 然後在原本的視訊會議畫面上方，點擊【會議記錄】，就能開啟已經存在的Google Docs文件，或是上傳、新增新的文件，不僅能透過視訊會議的各種功能即時交流，也能一起編輯文件檔案。
4. 在原本的視訊會議畫面上方，可以分享螢幕畫面，
分享螢幕畫面的方法如下：
 1. 按一下螢幕頂端的【螢幕分享】。
 2. 在接下來出現的畫面中選擇桌面或特定視窗。
 3. 按一下【分享選取的視窗】。
 4. 若想停止分享畫面，只要再按一下【螢幕分享】即可。

Figure 3-6 Online tutoring feature

Before tutors and students do the online tutoring activities, they should to link to this page. The operate instructions are shown in this page. If tutoring has some problems, they could solve by using the solutions in the bottom of the page.

When they click the start to tutoring button, tutors and students could start to take today's course. Our system will record the beginning of time. After finished tutoring, tutors need to click the sign off button, system will record the time.

In the sidebar, we design three features about course. There are course syllabus, course material, and teaching journal.

線上課輔-課程大綱

在第一次教學前請上傳課程大綱。

欄位	資料																		
課程名稱：	英文																		
課輔教師：	測試用(女)																		
目前就讀學校：																			
授課對象：	測試用(男)																		
課輔學生就讀學校：	年級																		
授課年月：	年 月																		
授課時數：	每週 每次上課小時																		
課程概述與目標：																			
課程大綱	<table border="1"> <thead> <tr> <th>週數</th> <th>單元主題</th> <th>內容綱要</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> </tr> </tbody> </table>	週數	單元主題	內容綱要	1			2			3			4			5		
	週數	單元主題	內容綱要																
	1																		
	2																		
	3																		
	4																		
5																			

- 上傳課程大綱
- 課程教材
- 課輔日誌

Figure 3-7 Course syllabus

First is course syllabus. Tutors need to upload the course syllabus before they start to teach. Students could know the process of this course.

線上課輔-教材總覽

每次教學前請上傳教材。

上傳日期	教材標題	教材檔案名稱
2012-06-13 17:47:48	how	How.doc
2012-06-13 17:35:29	SENTENCES	sentences.pdf

- 課程大綱
- 上傳教材
- 課輔日誌

Figure 3-8 Course materials

Tutors upload their course materials to this online tutoring system. Students could download these materials to preview and review.

線上課輔-填寫課輔日誌	
欄位	資料內容
會員帳號	testTeacher
姓名	測試用
身分	teacher
填寫時間	2012-06-23 15:08:58
上課主題	<input type="text"/>
上課進度	<input type="text"/>
是否有達到預期上課進度	<input type="radio"/> 有 <input checked="" type="radio"/> 沒有
課程情況說明	<input type="text"/>
<input type="button" value="填寫完成"/> <input type="button" value="清除重填"/>	

- 課程大綱
- 課程教材
- 課輔日誌

Figure 3-9 Teaching journal

This feature only provided to tutors. Each time they finished the online tutoring, tutors should to fill out the form to record course process and situations. Tutors could adjust their teaching methods or materials based on students' learning situations. We could know about the tutors' teaching attitude and students' learning situations from these teaching journals.

老師討論區											
<p>此討論區為公開討論平台，提供老師與老師之間知識交流、問題討論、分享生活經驗或是發表意見</p> <p>學生無法進入此討論區進行討論</p> <p><input type="text"/> <input type="button" value="搜尋"/></p> <p>排列方式： 日期小到大 日期大到小 點閱率小到大 點閱率大到小 </p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th style="width: 25%;">發佈時間</th> <th style="width: 50%;">討論主題</th> <th style="width: 12.5%;">發佈人</th> <th style="width: 12.5%;">點閱率</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>				發佈時間	討論主題	發佈人	點閱率				
發佈時間	討論主題	發佈人	點閱率								

- 老師討論區
- 學生討論區
- 發表討論主題
- 討論區規範

Figure 3-10 Tutors' forum

This forum was constructed for tutors. They can discuss about their teaching problems which they faced. They also can exchange their teaching experiences here.

學生討論區

此討論區為公開討論平台，提供學生與學生之間知識交流、問題討論、分享生活經驗或是發表意見。

老師也可觀看學生間提出的問題，進而回覆解答。

排列方式：| [日期小到大](#) | [日期大到小](#) | [點閱率小到大](#) | [點閱率大到小](#) |

發佈時間	討論主題	發佈人	點閱率

學生討論區

發表討論主題

討論區規範

Figure 3-11 Students' forum

Students can discuss about their problems of learning here. They can solve other students' problems and tutors also could come here to solve their problems.

相關連結

線上課輔

交通大學 e-Tutor 線上課輔系統	http://etutor.nctu.edu.tw/NCTUeTutor/etutor/default.aspx
My e-Tutor學習網	http://www.myetutor.net/Default.aspx
線上協同學習平台	http://e-tutor.itsa.org.tw/e-Tutor/
e-tutor園地	http://cyber.tku.edu.tw/teacher/etutor.htm

數位學習

台北市數位學習網	http://elearning.tp.edu.tw/ (國小到高中職適用)
愛學網	http://stv.moe.edu.tw/ (國小到國中適用)

Figure 3-12 Related link

In this page, we provided vary links about leaning to users. They can learn by themselves through these links.

聯絡我們

麻煩您填寫下列個人資料，以方便我們儘速處理。謝謝您!!

姓名	<input type="text" value="dcslab_member"/>
電子郵件信箱	<input type="text"/>
留言內容	<input type="text"/>

Figure 3-13 Contact us form

If users have any problem, they can fill out the form to contact system administrator. When system administrator has finished solve their problem, system administrator will notify the person who filled out the form.

網站地圖						平台介紹
網站首頁	最新消息	線上課輔	交流園地	相關連結	個人資料	
<ul style="list-style-type: none">平台介紹上課須知網站地圖		<ul style="list-style-type: none">課程大綱課程教材課輔日誌	<ul style="list-style-type: none">老師討論區學生討論區	<ul style="list-style-type: none">英語學習	<ul style="list-style-type: none">修改密碼查詢結算	
						上課須知
						網站地圖
						網站功能導覽影片

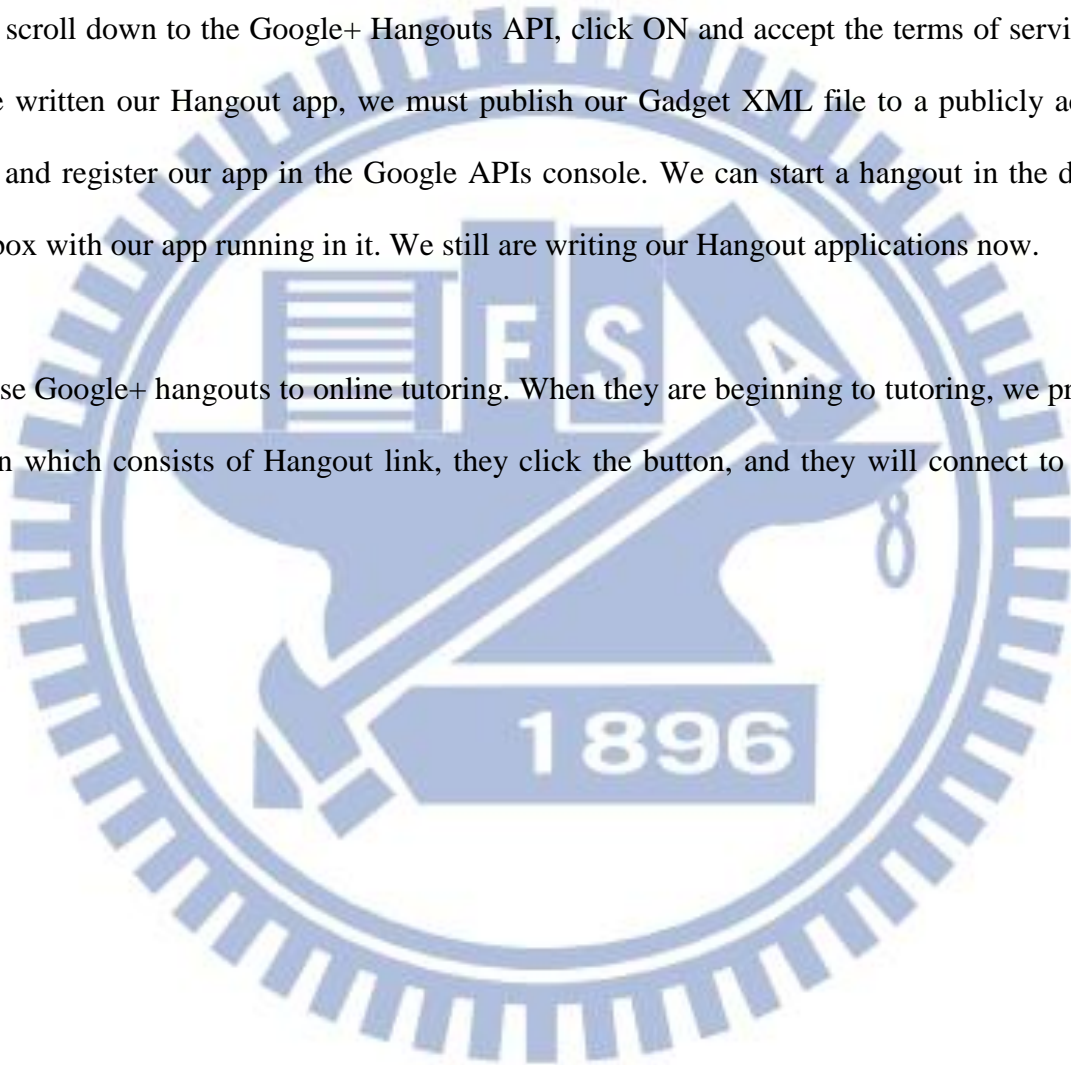
Figure 3-14 Sitemap

We provided a sitemap page to users, they can know about what pages have certain features. And they can link the page directly through the sitemap.

3.2 Integrate Hangout experience in Online Tutoring System

Google+ Hangouts API enables users to develop apps and run in Google+ App. We can download the open source code. Before we can use the Google+ Hangouts API, we need to create a project in the Google APIs console. We could create a new project or open the sample project. Then scroll down to the Google+ Hangouts API, click ON and accept the terms of service. After we've written our Hangout app, we must publish our Gadget XML file to a publicly accessible URL and register our app in the Google APIs console. We can start a hangout in the developer sandbox with our app running in it. We still are writing our Hangout applications now.

We use Google+ hangouts to online tutoring. When they are beginning to tutoring, we provided a button which consists of Hangout link, they click the button, and they will connect to Hangout page.



3.3 Implementation Tools

In this program, we use a number of open source tools and libraries for developing the online tutoring system as shown Table3-2.

Table 3-2 Implementation Tools

Name	Usage	Version	License
PHP	Programming	5.2.6	PHP License
Apache HTTP Server	Web server	2.2.8	Apache License 2.0
MySQL	Database	5.0.21b	GNU GPL
phpMyAdmin	Database Manager	2.10.3	GNU GPL

We use PHP programs to construct our online tutoring system, design the web pages and system features. The majority of web servers on the Internet are using the Apache HTTP Server. Using MySQL to store data, such as member's information, course materials and news, discuss content and so on. PhpMyAdmin is intended to handle the administration of MySQL with the use of a Web browser, and it supports a wide range of operations with MySQL. Through phpMyAdmin, we can manage data which stored in MySQL and execute SQL statements

4 System Demonstration

4.1 Online Tutoring Flow Scenarios

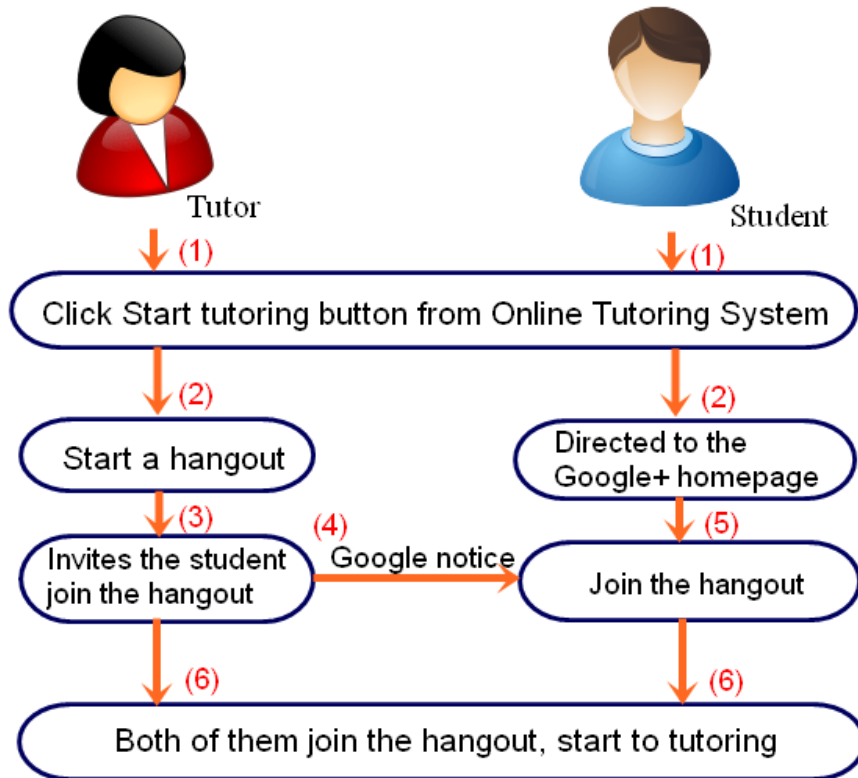


Figure 4-1 Online Tutoring Flow Diagram

The scenario of the online tutoring flow diagram is shown in Figure 4-1. In this diagram, we illustrate step by step, initially, tutor and student both log in the online tutoring system, turn to the online tutoring page,(1) click the start tutoring button to start tutoring. (2) Tutor's page will open the hangout window automatically. Student's page directed to the google+ homepage. (3) Tutor need to invite student to join the hangout. So tutor click Invite at the hangout window and type student's name or student's mail to invite student. Then, click start hangout button at the hangout

window, the hangout is started. (4)When tutor already invited student to join the hangout, google will notice student that someone invited you to join the hangout automatically. (5)Student joins the hangout. (6) When both already join the hangout, then start tutoring. Before tutoring, both of them need to make sure their microphone and camera are working correctly.

After finished today course and exited the hangout, tutor needs to write teaching journal which recorded the progress of teaching and tutoring situation. Figure 4-2 showed that the teaching journal form.

欄位	資料內容
會員帳號	testTeacher
身分	teacher
填寫時間	2012-05-02 23:38:02
上課主題	
上課進度	
是否有達到預期上課進度	<input type="radio"/> 有 <input checked="" type="radio"/> 沒有
課程情況說明	

Figure 4-2 teaching journal

4.2 Online tutoring in Google+ Hangout

4.2.1 Google+ Hangout interface

Figure 4-2 shows the screenshot of Hangout interface. Tutor and student can see each other's page at (1). Participants can use “Notes”, “Sketch”, “Add a document” and “Group chat” functions at the sidebar at (2). Also can use (3) “Screen share” function to share screen to other participant. (4)The settings page helps confirm that participant's computer, microphone and webcam are set up and ready to use. If today course is finished, click the “exit” button to exit the hangout at (5).

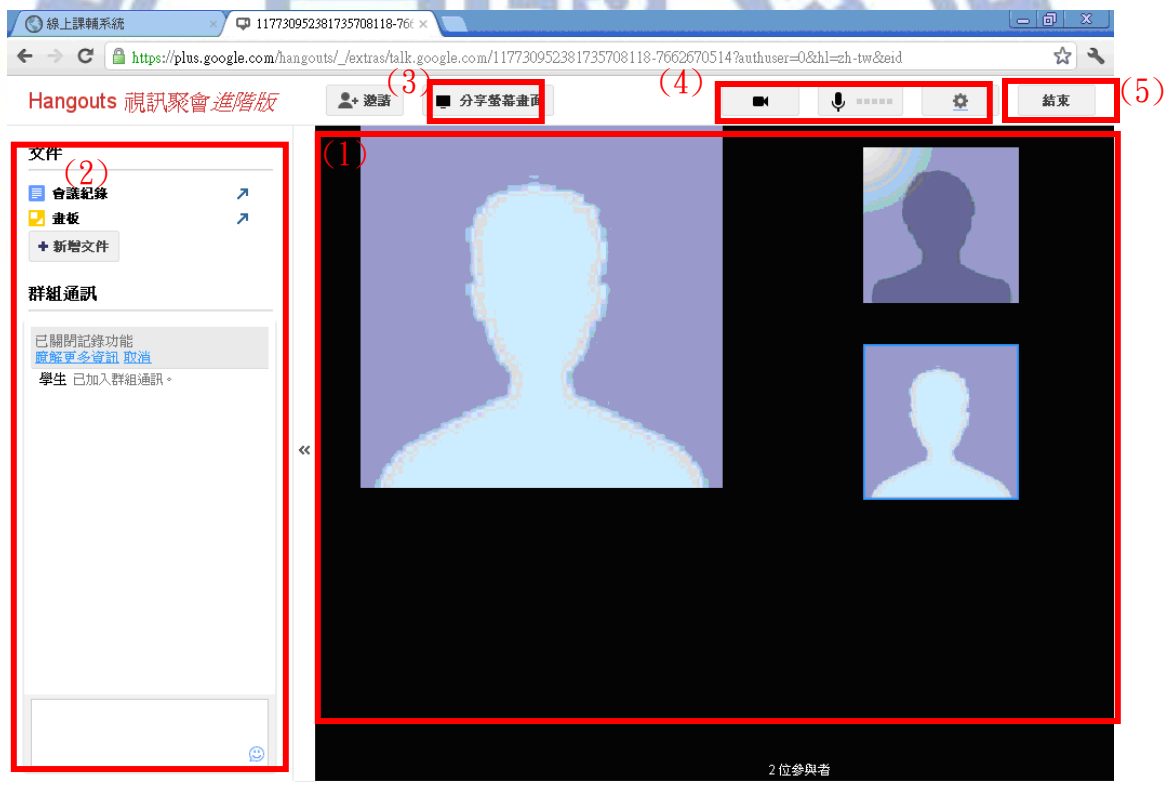


Figure 4-3 Screenshot of Hangout interface

4.2.2 Tutors and students' interaction

■ Notes

To edit a note to the hangout, click the “Notes” at the top of the sidebar. Tutor can share notes with student. Both of them can take notes or edit collaboratively. If some words we want to search it, click Right-Click to choose “search”, it will appear a small window in the center of hangout that show the searching results. It do not need to switching windows. It can insert the link to the word which we searched directly.

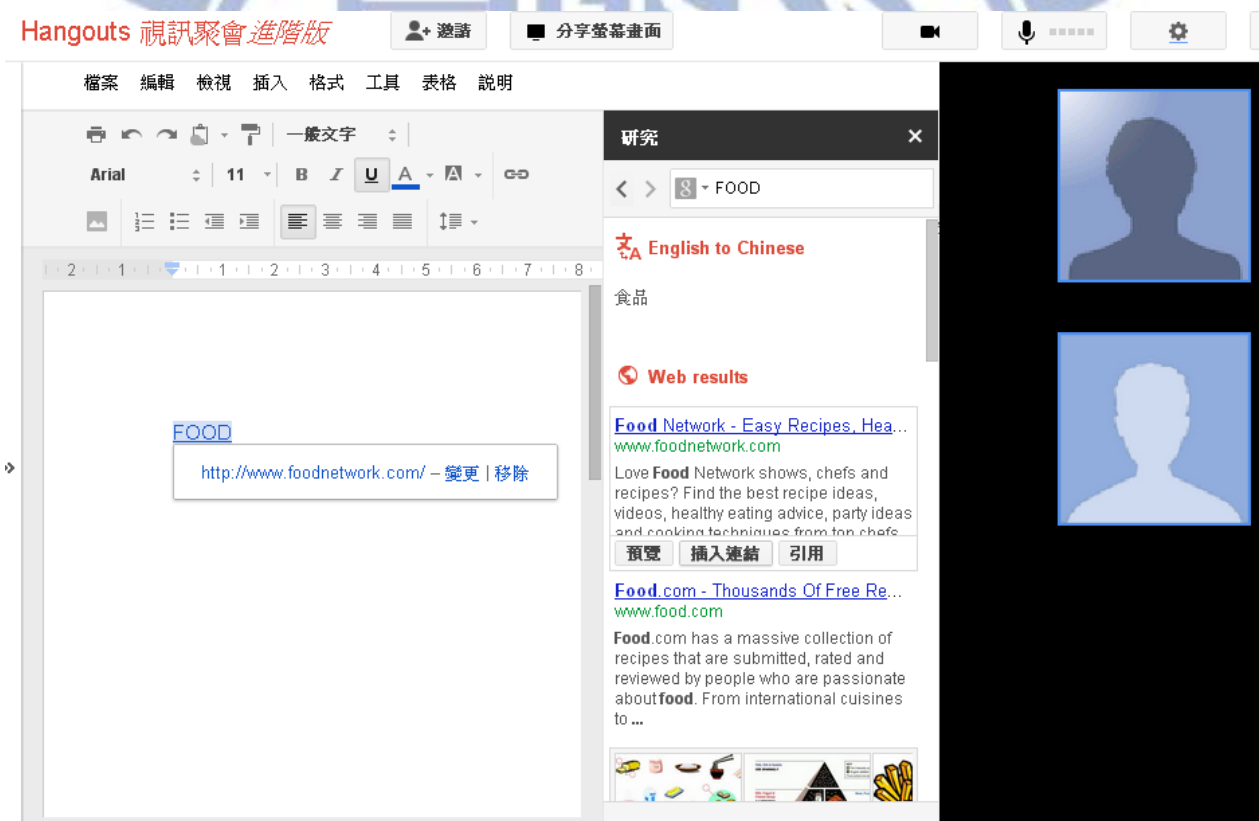


Figure 4-4 search directly and the results were showed in the center of hangout

■ Sketchpad

To sketch something to the hangout, click the “Sketchpad” at the top of the sidebar. This will create a blank Sketchpad document which allows users to collaborate in real-time. Tutor can collaboratively draw diagrams with student. By using handwriting tablet, tutor could write questions, equations, concept diagramming or tutoring his/her student in math easily and conveniently.

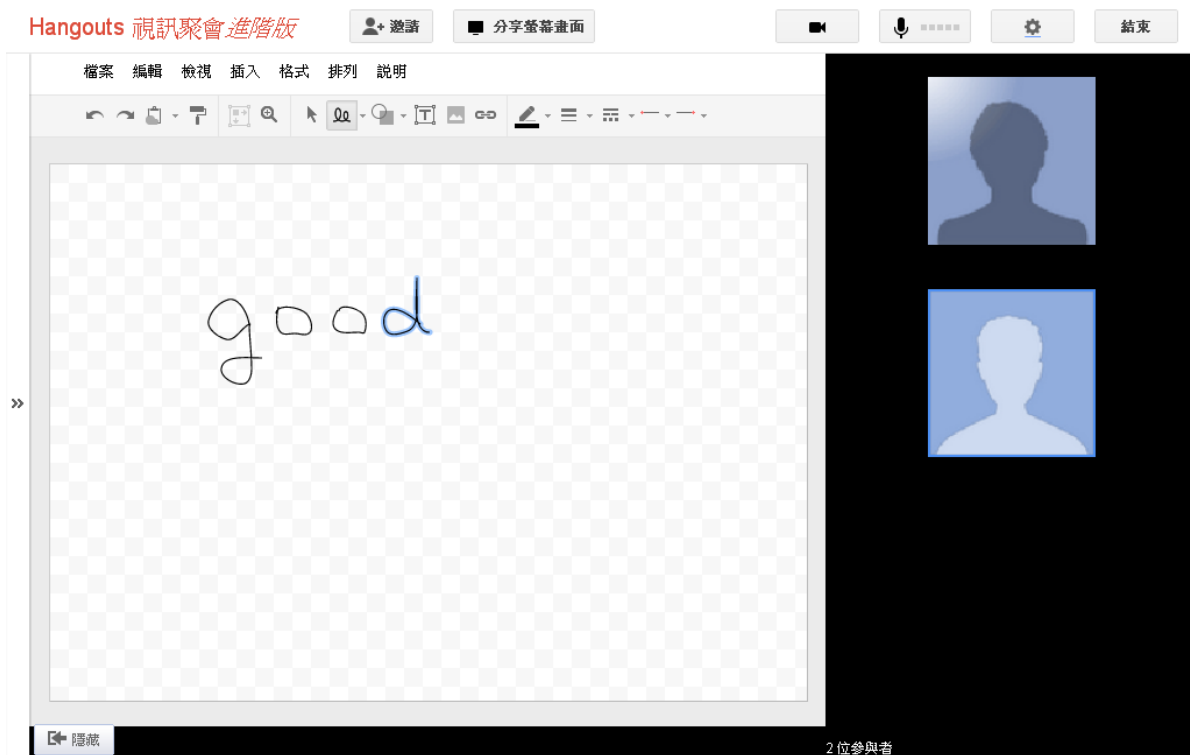


Figure 4-5 Sketchpad

■ Add a document

To add a document to the hangout, click the “add a document button” at the top of the sidebar. Figure 4-5 showed that choose the documents you’d like to share and click “Select”. It can upload different types of documents, such as ppt, pdf, doc and etc. The video file also can be uploaded to the hangout. The document will show up in the left portion of the video screen. Tutor can share his/her course materials or a google document with his/her student. Figure 4-6 showed that the document which was added in the hangout could be annotated. The annotated document will save in their Google Doc.



Figure 4-6 Add a document

檔案 編輯 檢視 插入 投影片 格式 排列 表格 說明

4 現有的線上課輔系統

5 研究目的

- 建立一個結合社群網站功能的網路課輔系統，利用網路媒介跨越城鄉空間障礙，進行一對一的即時線上課業輔導。
- 藉由結合社群網站模式提升學生的學習興趣並塑造一個師生間能夠即時互動的諮詢管道。
- 使用介面操作簡易

6 系統功能規劃

7 系統首頁

8 老師管理使用模式

按這裡新增附註

Figure 4-7 annotated notes

■ Share screen

Click the “Share Screen” button at the top to share own screen with others. If you have multiple windows open, you will be asked to choose one to share. Select that window, then click share.

Tutor could use screen share to collaboratively browse the website with student.

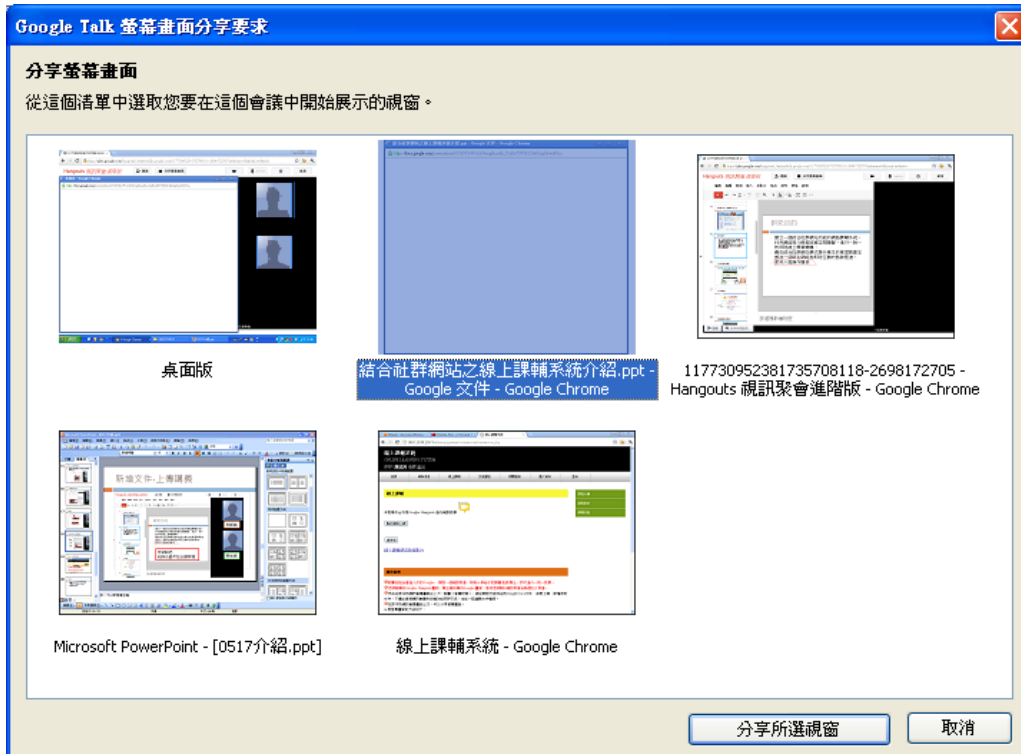


Figure 4-8 Screen share

- Group Chat

This feature let tutor could chat with student. If student can't hear what tutor said, student could type something to notify tutor. Tutor could type steps to solve student's problems.

- Invite

In the hangout, still could invite someone to join the hangout. It can invite mobile users who installed google+ app. But in our online tutoring system, it is not allow tutor or student to invite other person to join this hangout when they are tutoring.

5 Experiment and System Evaluations

5.1 Experiment

We have an experiment with Jhongli commercial high school. The experimental subjects consist of 4 students and 4 tutors. The educational level of tutors is college student and master. The students are grade one students in senior high school. We provided one-to-one tutoring. The tutoring time is one hour per week. We asked the tutors come to the computer lab and do the online tutoring activity. Because this is the first experiment, we want to know the real situation about this experiment. And if something happened, we could help or adjust immediately. Before the online tutoring, we introduced our system and illustrated how to operate to tutors. In the students' side, their class teacher had explained the operations of online tutoring system. Students can stay in their home and do the online tutoring activity.

We observed that they do the online activities very fluently. Sometimes the student faced some problems and he did not know how to solve, the tutor will give the student some opinions and solve the problems. The student also asks the homework questions to the tutor actively. Their subject is math, and they found that they write something in sketchpad, the writings sometimes do not showed in the hangout. They had no other problem in the Hangout.

5.2 System Usability Test

When this system is completed, we invited some tutors and students to use it. Before they use the system, we illustrated this system how to use it. If they had any questions, we could help them instantly. After they had enough know about this system, we let them to fill out the questionnaire of system's usability.

We adopt the questionnaire System Usability Scale (SUS) developed by John Brooke [33] to evaluate the users' view of system's usability. The SUS has ten items which is composed of five positive statements and five negative statements. Five-point scale ranges from 1 as strongly disagree to 5 as strongly agree was used for the measurement. The SUS scores have a range of 0 to 100.

To calculate the SUS score, first sum the score contributions from each item. Each item's score contribution will range from 0 to 4. For odd items (1,3,5,7,and 9) the score contribution is the scale position minus 1. For even items (2,4,6,8 and 10) the score contribution is 5 minus the scale position. To obtain the overall value of SUS, need to multiply the sum of the scores by 2.5. Total score is 100.

Totally, we had 58 participants, 37 were students and 21 were tutors. Among the participants, the age of participants ranged from 19 to 30 years old; 25 were female, and 33 were male. Most of them had e-learning experience. We thought that they were very familiar with Internet, because they had above four years Internet experience. Their partial personal information was shown in Table 5-2 and Table 5-3.

Table 5-1 Personal Information of Participants

Role	Participants	Gender		Age(years old)				E-Learning Experience(y/n)	
		Male	Female	19-22	23-26	26-30	Above 30	yes	no
Tutor	21	9	12	2	15	2	2	17	4
Student	37	24	13	6	28	3	0	24	13

Table 5-2 Personal Information of Participants

Role	Education level			Internet experience (Years)			Spend hours on the Internet per day(Hours)			
	College	Master	Professor	4-7	7-10	Above 10	1-4	4-7	7-10	Above 10
Tutor	6	14	1	4	6	11	4	4	5	8
Student	18	18	1	2	11	14	8	9	10	10

All tutors' questionnaires were valid questionnaires. In these 37 students' questionnaires, 35 questionnaires were valid, 2 questionnaires was invalid. We divide the questionnaire results into two parts to explain.

5.2.1 Tutors' SUS Questionnaire Result Analysis

The following is that we show the SUS score of tutors' questionnaire results and explain some findings in the results.

Table 5-3: Descriptive Statistics of Tutors' SUS Questionnaire

	N	Mean	Median	Min	Max	SD
Statistics	21	78.6	80	52.5	100	14.3

Listed in table 5-3 are the "SUS scores" of Tutors' SUS Questionnaire. As summarized in table 5-4, the mean SUS score is 78.6, the maximum is 100 and the minimum is 52.5. Since the Mean and the Median are 78.6 and 80, respectively, these scores indicate that the Social Network based Online Tutoring system is usable.

Table 5-4: Tutors' SUS Questionnaire and Statistics of Each Item

System Usability Scale	Mean	SD
1. I think that I would like to use this system frequently	4.3	0.6
2. I found the system unnecessarily complex	2	0.8
3. I thought the system was easy to use	4.2	0.7
4. I think that I would need the support of a technical person to be able to use this system	2.3	1.2
5. I found the various functions in this system were well integrated	4	0.7
6. I thought there was too much inconsistency in this system	1.9	0.7
7. I would imagine that most people would learn to use the system very quickly	4.1	0.7

8. I found the system very cumbersome to use	1.6	0.6
9. I felt very confident using the system	4.4	0.6
10. I needed to learn a lot of things before I could get going with this system	1.9	0.7

This survey in Table 5-4 revealed the following findings:

- The odd items gained the highest mean. It indicated that most tutors felt very confident while using the Social Network based Online Tutoring system. They showed that this system achieved good characteristics such as attractive to interact with, easy to use, and quick to learn.
- The standard deviation of 4th item was relatively high. It indicated that some tutors were familiar with Online Tutoring system, but some were not. Some tutors still needed a technical person who illustrates how to use this online tutoring system. Therefore, some needed technical supports, but some could use the system totally by themselves

5.2.2 Students' SUS Questionnaire Result Analysis

The following is that we show the SUS score of students' questionnaire results and explain some findings in the results.

Table 5-5: Descriptive Statistics of Students' SUS Questionnaire

	N	Mean	Median	Min	Max	SD
Statistics	35	71.8	70	50	92.5	13.1

Listed in table 5-5 are the "SUS scores" of Students' SUS Questionnaire. As summarized in table

5-6, the mean SUS score is 71.8, the maximum is 92.5 and the minimum is 50. Since the Mean and the Median are 71.8 and 70, respectively, these scores indicate that the Social Network based Online Tutoring system is usable.

Table 5-6: Students' SUS Questionnaire and Statistics of Each Item

System Usability Scale	Mean	SD
1. I think that I would like to use this system frequently	4.1	0.5
2. I found the system unnecessarily complex	2.3	0.9
3. I thought the system was easy to use	4.2	0.6
4. I think that I would need the support of a technical person to be able to use this system	2.5	1.1
5. I found the various functions in this system were well integrated	3.9	0.7
6. I thought there was too much inconsistency in this system	2.2	0.9
7. I would imagine that most people would learn to use the system very quickly	4	0.8
8. I found the system very cumbersome to use	1.8	0.7
9. I felt very confident using the system	4.1	0.7
10. I needed to learn a lot of things before I could get going with this system	2.6	1.1

This survey in table 5-6 revealed the following findings:

- The 3rd items gained the highest mean. It indicated that most of students thought that this is an easy to use system.
- The next three with higher ranks were the 1st, 7th, and 9th items. It indicated that most of students would like to frequent to use this system, and could imagine that other people who can quick to learn and they felt confident when they were using the system.

- The standard deviation of 4th item and 10th item were relatively high. It indicated that some students thought that they need support from technical person, and they need to learn a lot of things before they could get going with this system. But some students were not. They could use this system directly by themselves.

5.3 Qualitative Research

After finishing interaction with the online tutoring system and filling out the SUS questionnaire, we had interviews with some students and some experts who have plentiful experiences in online tutoring. We want to know their thoughts or ideas on our online tutoring system.

There are twenty-three people were interviewed. Seven of them were female, and sixteen were male. The age ranges from 20 years old to 30 years old. The average time for an interview was approximately 5 to 10 minutes. Their responses were record in document forms.

Our first question was asked them how did they feel about this online tutoring system. These interviewees described their feelings and thoughts. We got some useful information. Their responses were leading to four main categories.

- **Satisfaction**

Most of interviewees said that they felt the online system interface is beautiful and user-friendly. They found the various functions in this system were well integrated and will continue to use this system.

- **Operation**

They said that it is very simple, easy and convenient to use this system. They felt confident when

they were using the system.

■ System conception

They thought that social network based online tutoring system is a creative and innovative idea. It is a new way to online tutoring.

■ Learning

Some interviewees said that this online tutoring system could enhance the learning effect for students in remote districts and increase more interaction with students.

The experts had given some advices.

1. Account Integrated. Because now they need to sign in the online tutoring system and sign in the google. If we could integrate the account, it must be convenient for tutors and students.
2. Recording. Their online tutoring videos need to be recorded. If the teaching videos had recorded, they could see or edit the videos. For students, they could review it. For the tutors, they could know about the teaching situation and improve their teaching skills.
3. When tutors and students do the online tutoring at their home, we could not know the real situation of tutoring. If something happened suddenly, we can not solve it instantly. Let two parties do the tutoring activities in school computer lab, most situations we could control, the problems they faced will reduced.

6 Conclusion and Future works

6.1 Conclusion

In our system, we create a social network based online tutoring system. We use the Google+ hangout to be tutoring software. Google+ hangout is functional enough for presently tutoring, and it is free to use Google+ hangout. Start a hangout like enter a privacy classroom. Tutors could use the tools of the classroom to share resources, explain complicated diagrams and review papers with students. Students could discuss problems with their tutors, and receive their tutor's responses instantly. Our online tutoring system also provides discuss forums for them. Tutors could share their teaching experiences in tutor's discuss forum, and could do their best to answer the questions that students posted in student's discuss forum. The teaching journals which tutor wrote were recorded in our database. We could understand the learning situation from this teaching journals.

Through the results of the SUS questionnaire, we found that most of users thought that this online system is usable and could enhance student's learning effectiveness. It could increase the interaction with tutors and students. We illustrate that online tutoring flow of our online tutoring system in detail. However, we also provide a user-friendly, simple interface for users. Because we want to let users who felt confident when he/she using this online tutoring system. From the Qualitative Research, we could confirm that our system is easy to use and they are satisfied with our online tutoring system.

6.2 Future work

There are some improvements for social network based online tutoring system. Through several experts' comment, we need to add some features. First, direct log in our system by using google's account. This could reduce the problem of duplicate login. Because users need to log in our system and log in google with their google accounts at present. Second, some expert thought that distance remote is an important feature in online tuition. Because when they are online tutoring, the student may play games or surf other websites that the tutor do not know. Add distance remote feature, tutor could catch student's attention. Third, we want to integrate the annotated materials to the online tutoring system. The tutor uploaded an original version of material to online tutoring system. The materials they used in tuition also recorded in our online tutoring system. Fourth, we want to customize the google+ hangout. We only have one whiteboard could write and do annotation now, we want improve this for add next blank whiteboard to use.

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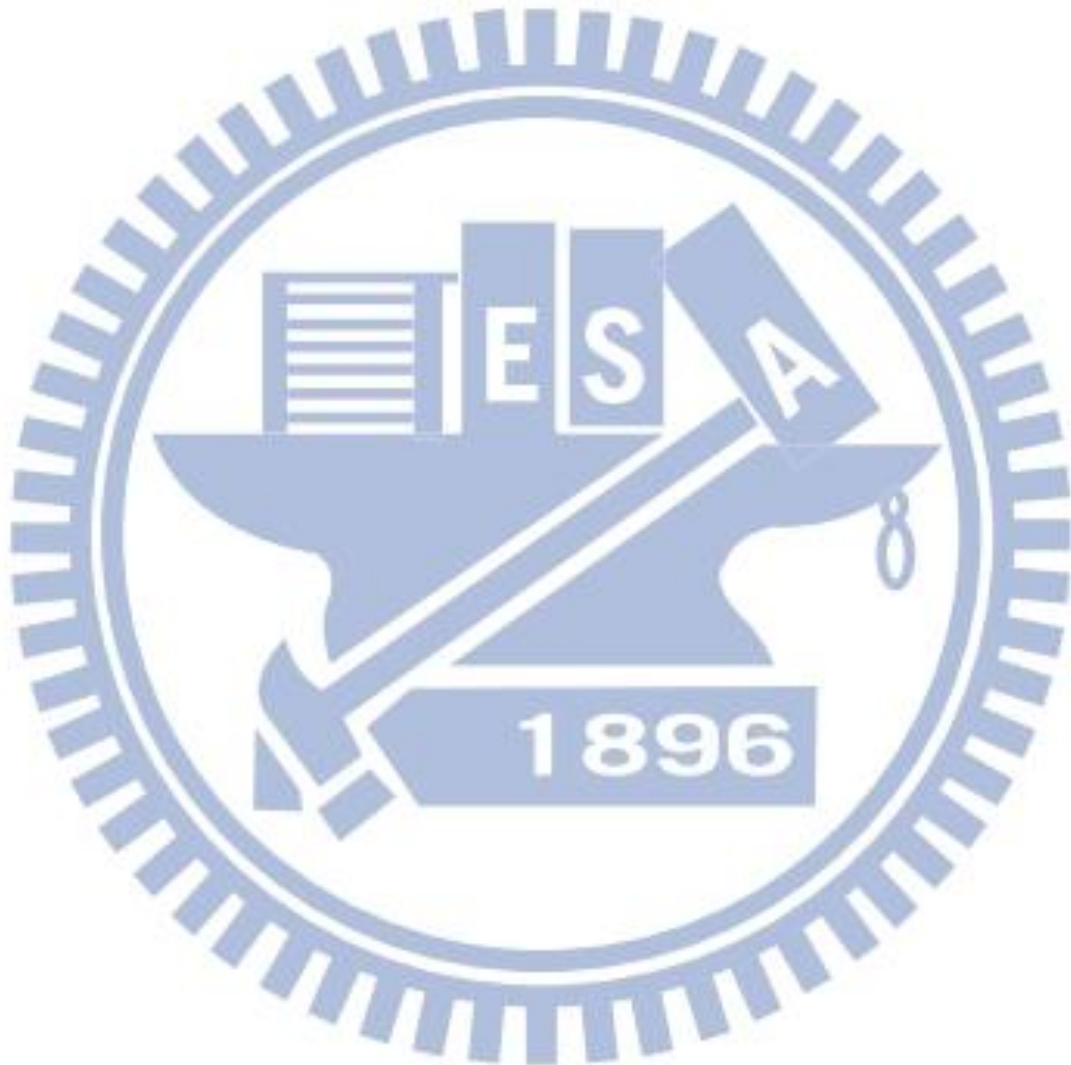
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Appendix A: System Usability Scale

System Usability Scale

	Strongly disagree				Strongly agree
1. I think that I would like to use this system frequently	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1	2	3	4	5
2. I found the system unnecessarily complex	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1	2	3	4	5
3. I thought the system was easy to use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1	2	3	4	5
4. I think that I would need the support of a technical person to be able to use this system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1	2	3	4	5
5. I found the various functions in this system were well integrated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1	2	3	4	5
6. I thought there was too much inconsistency in this system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1	2	3	4	5
7. I would imagine that most people would learn to use this system very quickly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1	2	3	4	5
8. I found the system very cumbersome to use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1	2	3	4	5
9. I felt very confident using the system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1	2	3	4	5
10. I needed to learn a lot of things before I could get going with this system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1	2	3	4	5

This questionnaire is based on the System Usability Scale (SUS), which was developed by John Brooke while working at Digital Equipment Corporation. © Digital Equipment Corporation, 1986.

Appendix B: Questions of Qualitative Research

Please write your experiences and feelings about this online tutoring system	
Please write something you thought that needs to improve in the online tutoring system	
Please write what features you want to add in the online tutoring system	

