

Research papers

This statement certifies that the following paper is based upon original research undertaken by the author and that the paper was conceived and written by the author alone. All information and ideas from others is referenced.

Chiu, Po-han

The Design and Application of a Virtual Field Trip System

Chiu, Po-han
Teacher Librarian
National Lo-tung Senior High School
Taiwan

The goal of this research is to use information and communication technology (ICT) to develop so-called “virtual field trip” system and the software follows the principles of the anchored instruction, whereby we can design a worksheet for outdoor education. The system combines the anchored instruction, worksheet, and image-based VR in order to make it as a supplementary tool for students before they have a field trip and to raise their learning motivation.

Besides, the research also discusses the difference between traditional outdoor education and the model mentioned above.

Key Words : image-based VR, anchored instruction, Virtual Field Trip(VFT)

Chapter 1 Introduction

1-1 *Rationale and background*

Jean Jacques Rousseau (1712-1778)¹ stressed on the importance of a complete and healthy physical activities during childhood, he affirmed that the naturally born interests and curiosities of children should be sufficiently developed and the goal could be achieved by reducing literary and philosophical educations and by adding more sentimental and logical reasoning ones. Rousseau believed that children should learn directly from experiences, and he indicated 《Our own foots, hands and eyes are our initial teachers》.(周儒、呂建政, 1999)

Along with the reform in Taiwanese society, open, countryside, and outdoor educations are highly stressed on teaching courses. However, due to the restriction of spaces in urban area, it's rather difficult to construct an ecological campus. Even we succeed to make one, the 'ecological' environment seems to be so artificial that it differs a lot from the real one. At the end, a community-centered 'natural trail' is figured out as the moderate solution. (林淑圭, 1995)。

The outdoor education in early period was similar to a hiking, a traveling, or a trip, which lacks of concrete objective and planning, not to mention of teaching process and activity design.(李崑山, 1993) Some scholars found out that there were schools just fooling around the outdoor courses, and there were some others didn't even practice the courses. (耿志華, 1995)

What were next were many outdoor environmental courses relative to activity design but without teaching experiments, nor evaluations. (陳忠照, 民 1995)。

While practicing outdoor field trip visiting, the limit of time and space makes students be hardly able to follow the guide of worksheets. As the result, students have obstacles on reminding their visits and the contents of the visits, so as to degrade the reviewing function offered by the worksheets. Walkway visits is therefore meant to be a browsing around trip.

The outside campus visits are usually proceeded from spot to spot, this method enables students to understand its content; however, it doesn't work for those activities needed multi-angles, repeated-observations and verified identifications that it results in an incomplete concept toward the learning walkway.

To overcome the difficulties of lacking objective environment as mentioned above, some foreign countries apply computer technology such as Virtual Field Trip (VFT) to sustain outdoor teaching. Nowadays, there are scholars proposing the idea in the country, but without practical teaching experiments to demonstrate the effect of VFT. What's more, the courses based on VFT are rarely discussed. This research is thus aimed to study on it.

The outdoor teaching varies from the designs by teachers. Hammerman supports the method 'inquiry' to deal with the questions systemically so as to inspire the thinking of learners. While designing outdoor teaching software, we should offer the users a real

¹ Jean Jacque Rousseau, French philosopher and literator.

environment and the opportunity for inquiry by questions. ‘Situated learning’ is one of the relecturingatives.

Situated learning theory emphasizes that learners must acquaint knowledge actively through interacting with the real environment. For example, the CTGV (Cognition and Technology Group at Vanderbilt) from the American university Vanderbilt proposed the ‘anchor type’ situated learning in order to solve the knowledge-rigid problem: ‘anchor’ the solution of a problem in a meaningful situation. The idea is realized by the design of interactive video disk system to build up a ‘story environment’, in which the contents referred to be lecturinged are embedded and a series of problems are explored and solved by learners. (CTGV, 1990; 徐新逸, 民 1995). ‘Anchor’ is hence known to be a macro database (Barden, 1996) which offers a lot of information and allows learners to go inquiring and to solve problems.

Our research aims to design a situated learning walkway system. The reconstruction of real situation is played as learning instrument, and there are questions to guide learners.

As for the techniques of reconstructing field trip situation, we adopt that of virtual reality, which gives a 360 degree round image and makes people feel like on the spot, and we also fix the initial platform by improving its interactive function. Our system based on the anchored instruction theory, containing pluralized information and embedded data design, enables students to think and solve problems from multiple perspectives, and to develop a complete concept toward the learning subjects, and finally to use worksheets as learning guide as mentioned above.

1-2 Researching Objectives

Our research objectives are as following:

1. To apply image-based virtual reality for constructing an almost real virtual learning field trip system and learning tools integrated with situation.
2. To adopt anchored instruction as the basic element of our system, and to use worksheets as tour guide.
3. To compare the differences of learning effect between using virtual field trip system and using traditional lecturing.
4. To Compare the differences of learning effect between using virtual virtual field trip system and traditional outdoor teaching.

Chapter 2 Literature Review

2-1 *The Development of Field Trip and Relative Software*

Both local and international scholars have concluded the difficulties and obstacles of outdoor teaching activities as following (Krepel & DuVall , 1981 ; Disinger , 1984 ; Orion & Hofstein,1991 ; Stainfield , 2000 ; 楊志誠 , 1993 ; 蘇禹銘 , 1998 ; 謝鴻儒 , 2000) :

1. On the aspect administrative:

- i. Some part of administrative superiors, teachers and students' parents do not support the activities.
- ii. The administrative procedures are complicated
- iii. Outdoor teaching activities interrupt normal courses, and there is also difficult to adjust the courses.
- iv. Sometimes it conflicts with other big activities held by schools.

2. On the aspect of the burden of teachers

- i. It's time-consuming to prepare outdoor teaching activities, so a heavy burden to teachers.
- ii. Teachers can't bear to arrange teachings and administrative works at the same time.
- iii. Teachers should assure the safety of students while outdoor activities.

3. On the aspect of the capability of teachers

- i. Teachers' bias on outdoor activities.
- ii. Outdoor teachings practiced by teachers do not meet the needs of courses.
- iii. Teachers are not familiar with local environments and human resources.
- iv. Teachers are short of teaching tools for practicing outdoor activities
- v. Teachers are lack of experiences and are not capable of designing outdoor teaching tools.
- vi. Teachers are not capable of controlling the time of outdoor activities

4. On the aspect of traffic and safety

- i. It's not easy to keep students in order
- ii. Too much safety reasons need be concerned
- iii. The difficulty of traffic if the outdoor activities are held in mountain side
- iv. Inconvenient of distance: too far away or walking too long

Meanwhile, there are some other problems during outdoor activities (Bellan & Scheurman , 1998 ; Tuthill & Klemm , 2002) :

1. The tour guide only explains the subjects of which he interests
2. Time wasting on keep students in order
3. Students with poor comprehension may not capture the contents of activities.
4. Students are not able to note while listening to the guide
5. It's not possible to concern of all the opinions of students
6. Students spend most of the time on fooling around

7. It's not easy to capture the point if there are too many contents at the sites

Under the circumstances that are not favor of field study, there are more and more geographers use Information and Communication Technology (ICT) on their researches, we call it Virtual Field Trip (VFT). (Ford , 1998 ; Gratton , 1997 ; Hurst , 1998 ; Phipps & Stainfield , 1998 , 1999 ; Warburton & Higgit , 1997)

VFT is a kind of computer information integration (Wood , 1997) on the purpose of achieving a real field trip or a trip without needing of a real trip (Woerner , 1999) . It is a media interactive situation produced by computers simulating a site (such as a laboratory, a museum, a park, a zoo, or a nation). VFT does not mean to establish a virtual reality, but to allow users to indulge and interact voluntarily in the situation produced by computers (Stainfield , 2000) . VFT does not aim to replace the real field study, but to introduce to students of the basic tool needed on real field study and to practice the reviewing work after a real field study (J. I. Spicer & J. Stratford , 2001; Gilmour , 1997) .

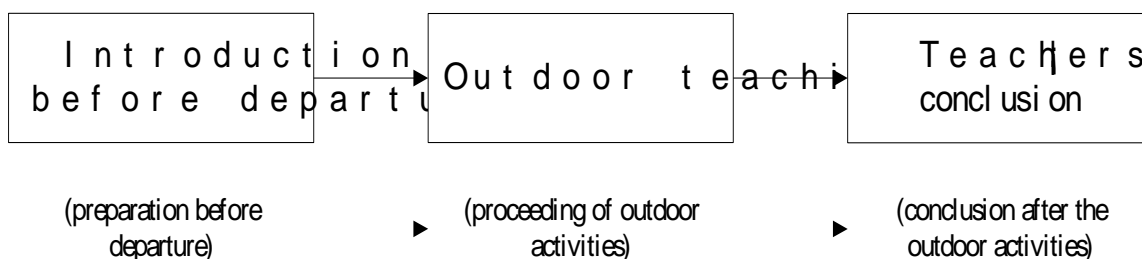
Belanger & Jordan (2000) and Stainfield (2000) list the advantages of VFT as following:

1. Centered by learners: it is students who control the time, they are able to learn when they have available time.
2. Arranged by an appropriate procedure: the system can arrange the orders of learning.
3. Multiple learning patterns: the composition of voices, images and words.
4. Flexible and efficient teaching: time table of courses and system operation can be adjusted.
5. Free from the limit of geography: learners can use it anytime, anywhere.
6. Free from the limit of time arrangement, time saving: learners can use it anytime, anywhere.
7. Easy to operate: the design of platform is similar to or based on internet browsers, which help reduce operating time.
8. Safe and applicable
9. The contents, languages and specialties can be controlled.
10. The information can be updated, and be linked with professional database.
11. Easy to be fixed and updated
12. Repeated-use.

The virtual learning walk system of my research is hence the kind of field study sustained by information technology.

2-2 Outdoor teaching pattern

I conclude what are applied as outdoor teaching patterns by elementary schools in Taiwan now and divide them into 3 stages as demonstrated by figure 2-3 and table 2-3:



Fig

Figure 2-3 outdoor activity stages

stage	preparation	proceeding of outdoor activities	conclusion after outdoor activities
students' job	introduction before departure	outdoor activities	review what are learned and relative subjects
teachers' job	-prepare teaching tools -motivate students -administrative works	outdoor activities	-conclude the activities -administrative works -evaluation

Table 2-3 outdoor activity stages and relative works

In order to know the performance of students using the software, the virtual learning walkway software is used to intervene in the stage of preparation and outdoor activities. Considering the researching subjects are 3rd grade students from elementary schools, whose developing cognitive and behavior ability are limited, I therefore define the outdoor activity as hiking, sustaining with worksheets as tour guide so as to prevent children from forgetting what they observe.

2-3 Application of Anchored Instruction Theory in The System

CTGV proposes to use anchor-type situated learning theory to solve 'knowledge-rigid' problem, which students can learn but can't apply what are learned afterward. The group asserts that knowledge is a tool. To learn any kind of knowledge, he must understand and absorb it, and puts himself in the situation and practice the knowledge.

Its teaching method is realized by daily life story to lecturing pluralized information and by embedded data design to allow students to think and solve problems through information and multiple perspectives. A learning expectation is a generative process. By this generative process, learners can distinguish actively the concepts from theories, and, at the same time, connect the new knowledge and their own experiences, and finally internalize into their

minds.

Here I conclude the anchored instruction and point out its common points to be served as the reference of my system design.

1. Anchored instruction is given a range to learn
2. The concept of anchor is to allow students to have the same anchor (destination) even they have different backgrounds, and to let them know right away what is 'the same theme' (the definition of "anchor")
3. There is no limit of teaching media (such as Jasper Series using videotape). In anchored instruction, the application of media is to help students acquaint the same theme rapidly and to offer information.
4. Using multi-media to teach
5. Using image-based virtual reality to establish real situations and to replace the shooting of the initial film.
6. Open-questions
7. The design of hided information
8. Complicated questions: the design of multiple-procedure solutions and sub-questions.

Chapter 3 Virtual Field Trip System

3-1 Developing Tool

The “virtual field trip system” of my research is developed by using Borland C++ Builder 5.0 based on the platform of Microsoft Windows 2000, the files can be applied on Windows95 and on the platform superior than Windows95 (including Window98, Window2000 and Window XP). The main techniques are as following:

1. Image-based virtual reality: using Java applet creating by Live Picture Corporation and embedding it into the system. Project the panorama pictures in the way of 3D (three dimensions) so as to produce a virtual situation.
2. Database technique: client port uses Microsoft Access 2000 as database, it then saves:
 - i. The questions of worksheets edited by teachers
 - ii. Students’ personal information
 - iii. The solutions answered by students
 - iv. Websites recommended
 - v. Embedded data description
 - vi. Situation description
3. Combination with Microsoft programs: My system combines with Microsoft Word 2000, which enables to transform the solutions answered by students into Microsoft doc. format files, and to print or to email homework.

3-2 *System Framework*

The system design of my research is based on ‘situation-type exploration’, which means, first of all, to select a situation, and then to design activity items and finally to bring into the recognition of integration. The system framework is demonstrated as following:

1. Unit

A unit is a complete learning range. There is a worksheet in a unit such as Mountain Elephant, Confucius Temple, Park Da-An.

2. Subject

A subject is the branch of a unit; there are many subjects in a unit. We can find a panorama situation and a key article in a subject such as nostalgic area on the summit of Mountain Elephant, the right door of Confucius Temple.

3. Anchor

An anchor is the branch of a subject, where learners can click on it with their mouse. There are many anchors in a subject. An anchor can be embedded into appropriate information served as references while writing worksheets or answering questions.

3-3 System Functions

The screen on student port of virtual field trip system is demonstrated as figure 3-1.



Figure 3-1 student port system: main image

There are 4 parts in student port system: control panel, demonstration area, information area, and worksheet writing area. Their functions are as following:

I. Control Panel: shown as figure 3-2



Figure 3-2 student port system: control panel

There are 9 functions in control panel:

1. Unit Menu: students can use pull-down menu and select 'unit'
2. Subject Menu: students can use pull-down menu and select 'subject' to switch situations.
3. Website Menu: students can find the websites recommended by teachers in the website menu, pulling down the menu and select it to activate the inner-equipped browser,

demonstrated as figure 3-3. In the image, there are websites recommended by teachers. When students select the website, the system will link to the website and will gather information through browsing. Students can also enter keywords to search via Internet.



Figure 3-3 the selected image of 'website menu'

4. Notebook : notebook served as saving temporarily the solutions of questions, as shown as figure 3-4. Students can use notebooks to save information gathered from websites or copy information offered by information area in the notebook.



Figure 3-4 image of 'notebook'

5. IE Browser: click on IE browser, the system will show on first page, where students can link to searching engine for searching information.
6. Basic Info. Settings: students can set their basic information such as class, seat number, and name etc.

7. 3D View Tour Guide: shown as figure 3-5, students can choose the situation to where they want to go. The situation is switched right away after clicking the icon.

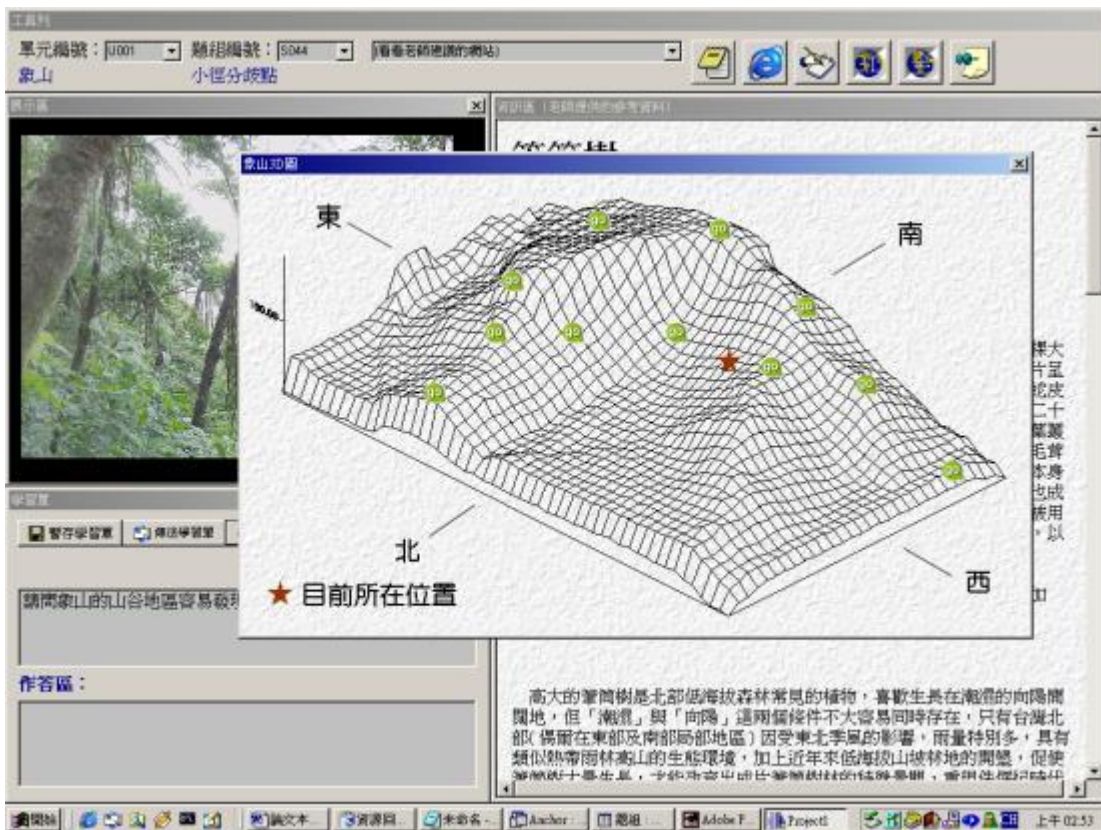


Figure 3-5 image of '3D view tour guide'

8. Panorama Tour Guide: shown as figure 3-6, students can choose the situation to where they want to go. The situation is switched right away after clicking the icon.

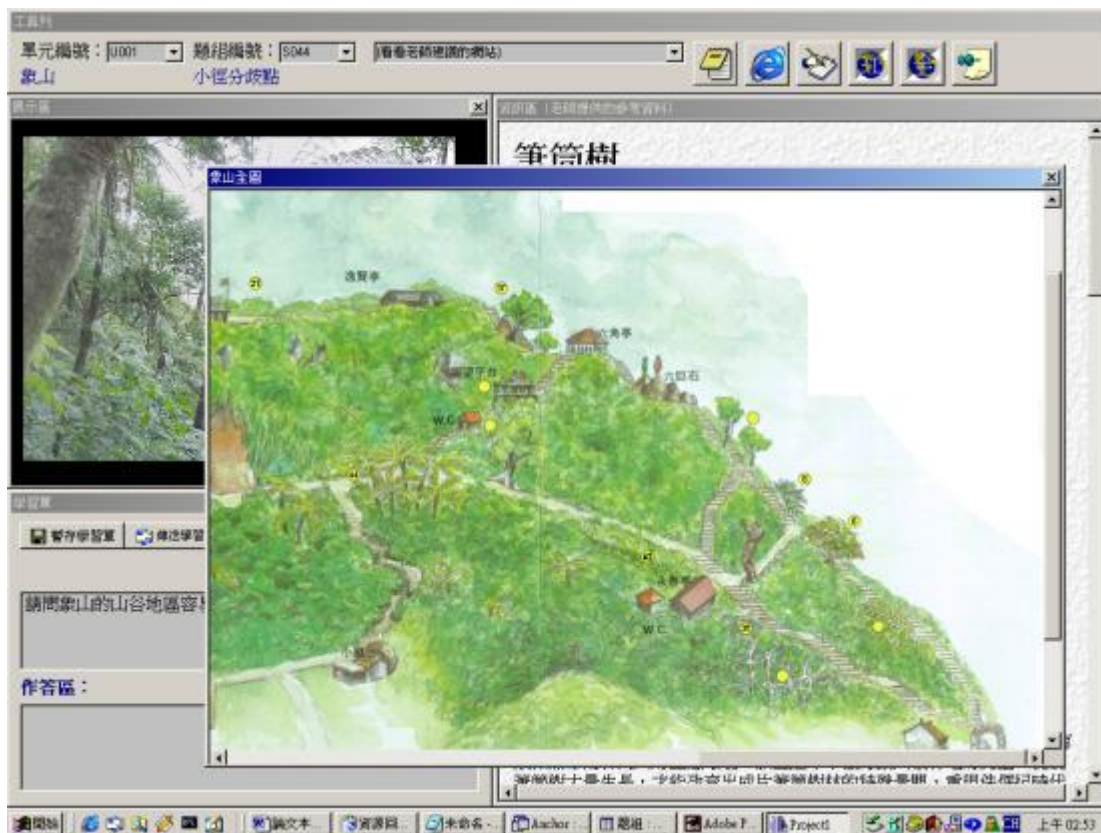


Figure 3-6 image of 'panorama tour guide'

9. Supplementary Info: there are many abstracted articles of plants from encyclopedia. Click the icon to have more information, shown as figure 3-7.



Figure 3-7 image of “supplementary info”

II. Demonstration Area: shown as figure 3-8



Figure 3-8 student port system: demonstration area

There are 3 functions in demonstration area:

1. Review in Panorama: to drag on left or on right by mouse to move the screen scene, students benefit from observing in the simulating situation.
2. Review in Close: If students are interested in specific spots, they can click on Z button to zoom in the scene, simulating the in close review in outdoor teaching.
3. Info. Reference Point: in the situation, there are many hidden info reference points which is the key point of learning and problem-shooting. When students move the cursor across the hidden info reference points in the screen scene, the cursor changes into ©. The content of information is appeared by clicking on the icon. Students can hence simulate the outdoor teaching for inquiry, shown as figure 3-9:

III. Information Area, shown as figure 3-9

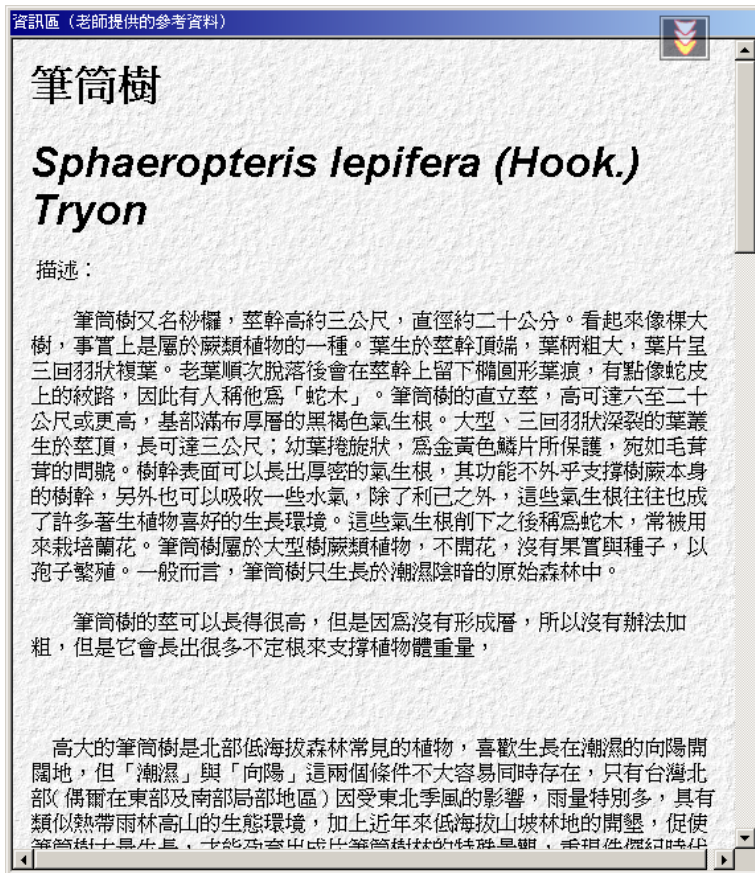


Figure 3-9 student port system: Information Area

Information Area demonstrate 4 kinds of contents: 1. the browsing internet information of teaching tools settings 2. the initial information while running system 3. supplementary information 4. the hidden information of teaching tools settings. The ways to run them are as following:

1. Website Menu: after choosing the website menu, there appears the websites recommended by teachers. The area allows students to link to other sites, shown as figure 3-3.
2. IE Browser: this area offers the links of searching engines
3. Supplementary Info: this area offers the links of supplementary teaching tools
4. Info Reference Point: this area offers the teaching contents and the answers of questions.

IV. Area of Worksheet Writing, shown as figure 3-10

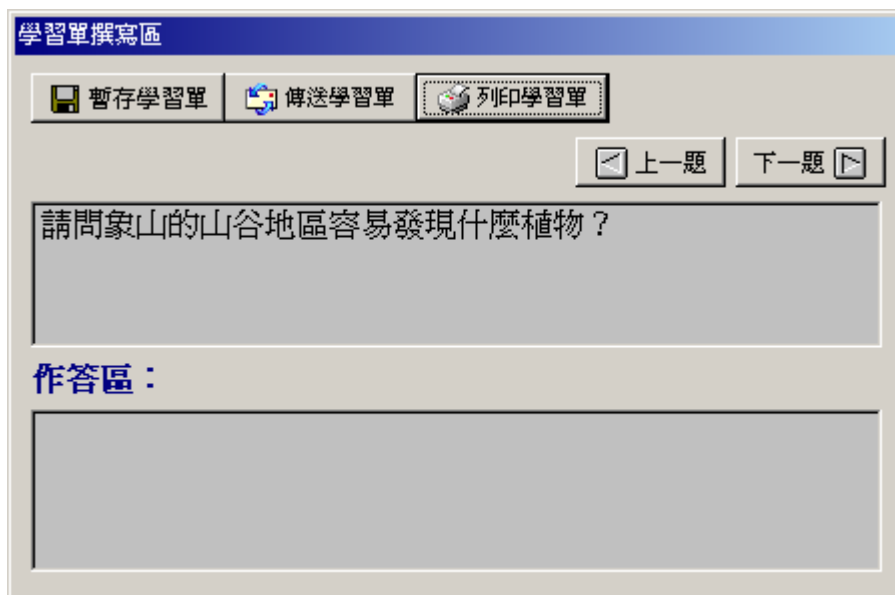


Figure 3-10 student port of system: area of worksheet writing

There are 5 functions in Area of worksheet writing:

1. Saving temporarily worksheets: the icon is served as calling for Microsoft Word, which students can save their answers into files of doc. format
2. Mailing worksheets: the icon is served as calling for the mailing tools set in the system, which students can send their worksheets via e-mail.
3. Printing worksheets: the icon is served as calling for the settings of a printer, which students can print their worksheets.
4. Choosing the previous question in worksheets: the icon allows students to go back to the previous question.
5. Choosing the next question in worksheets: the icon allow students to go to the next question.

3-4 The Mechanic of Worksheet

The design of worksheets is to allow students to operate the software with learning subjects. There are 8 questions in a worksheet. Here is the example:

- Question: There grow some plants along side a cliff. Take a closer look and write down their names. Draw one of the plants as well. Do you know their living conditions?
- Sub-question guide: 1. Write down their names 2. Draw one of them 3. Explain their living conditions.

Table 3-2 shows how the worksheet corresponds with the system

Table 3-2 worksheet mechanic example 1

Student's operation	System
1. under the guide of the worksheet, students must choose the situation "the cliff of Mountain Elephant"	The subjects between number 40 and 50 are the corresponded area, students can choose one of them and link the situation.
2. students observe the plants along side the cliff	Students can use "review in panorama" and observe the cliff by moving their mouse. If they want to take a close look at the plants, they can use "review in close" function. When they want to go "inquiry", they can click on the items that interest them where the "information area" will shows on the relative explanations.
3. students observe repeatedly	The plants that students should observe in the worksheet are common ones, so they may not be able to answer the question only by observing one spicy. They should go inquiry more information in the situation, so as does in outdoor teaching.
4. students draw the plants	Students should draw a site or a spicy of plants in the situation which makes them be more familiar with what they observe.
5. hypothesis	It's an open question. Students can have their own opinions after their observation, and they can write down their opinions in the worksheet.

Under the guide of worksheet, students can perform more functions of the system and explore more in the virtual situations.

Chapter 4 Experiments

To understand more about virtual field trip software and how it replaces traditional outdoor teaching activities, I use the software as intervention during outdoor teaching activities and I design Mountain Elephant Worksheet and teaching tools to gather information.

4-1 Experiment Subjects

My experiment subjects based on 85 3rd grade students in Wu-Shin elementary school in Taipei city. They are divided by class into experiment group 1, experiment group 2 and controlling group, shown as section 4-3.

4-2 Experiment tools

Experiment tools include teaching software and testing tools:

1. Teaching software: the virtual field trip software of my research.
2. Testing tools:
 - Worksheet: edited by myself, using during outdoor teaching.
 - Mountain Elephant learning test, using as pretest and post-test.

4-3 Procedure

1. Pretest

- i. Content: written test, using Mountain Elephant learning test.
- ii. Time: the 6th week after the beginning of semester. The test takes about 30 minutes.
- iii. Subjects: Experiment group 1, group 2 and controlling group.

2. Experiment management

- i. Preparation: before going briefing
 - Experiment group 1: before departure briefing is lectured by using the software at the information classroom of Wu-Shin elementary school in Taipei city for 40 minutes under the guide of teachers.
 - Experiment group 2: before departure briefing is lectured by teachers for 40 minutes. Teachers address the information of my offer.
 - Controlling group: before departure briefing is lectured by teachers for 40 minutes. Teachers address the information offered by me.
- ii. Outdoor teaching
 - Students of experiment group 1 and controlling group have their outdoor teaching in Mountain Elephant nature walkway for 100 minutes and they are asked to write worksheets during the activity.
 - Experiment group 2 have their outdoor teaching by using the software for 100 minutes in

the information classroom of Wu-Shin elementary school and they are asked to write worksheets during the operation of the software.

3. Post-test

- i. Content: written test
- ii. Time: after the outdoor teaching. It takes about 30 minutes.
- iii. Subject: Experiment group 1, group 2 and controlling group.

4. Conclusion by teachers

- i. Content: teachers of every class conclude the outdoor teaching after the activity.
- ii. Time: After the post-test
- iii. Subject: Experiment group 1, group 2 and controlling group.

The experiment procedure is demonstrated as figure 4-1:

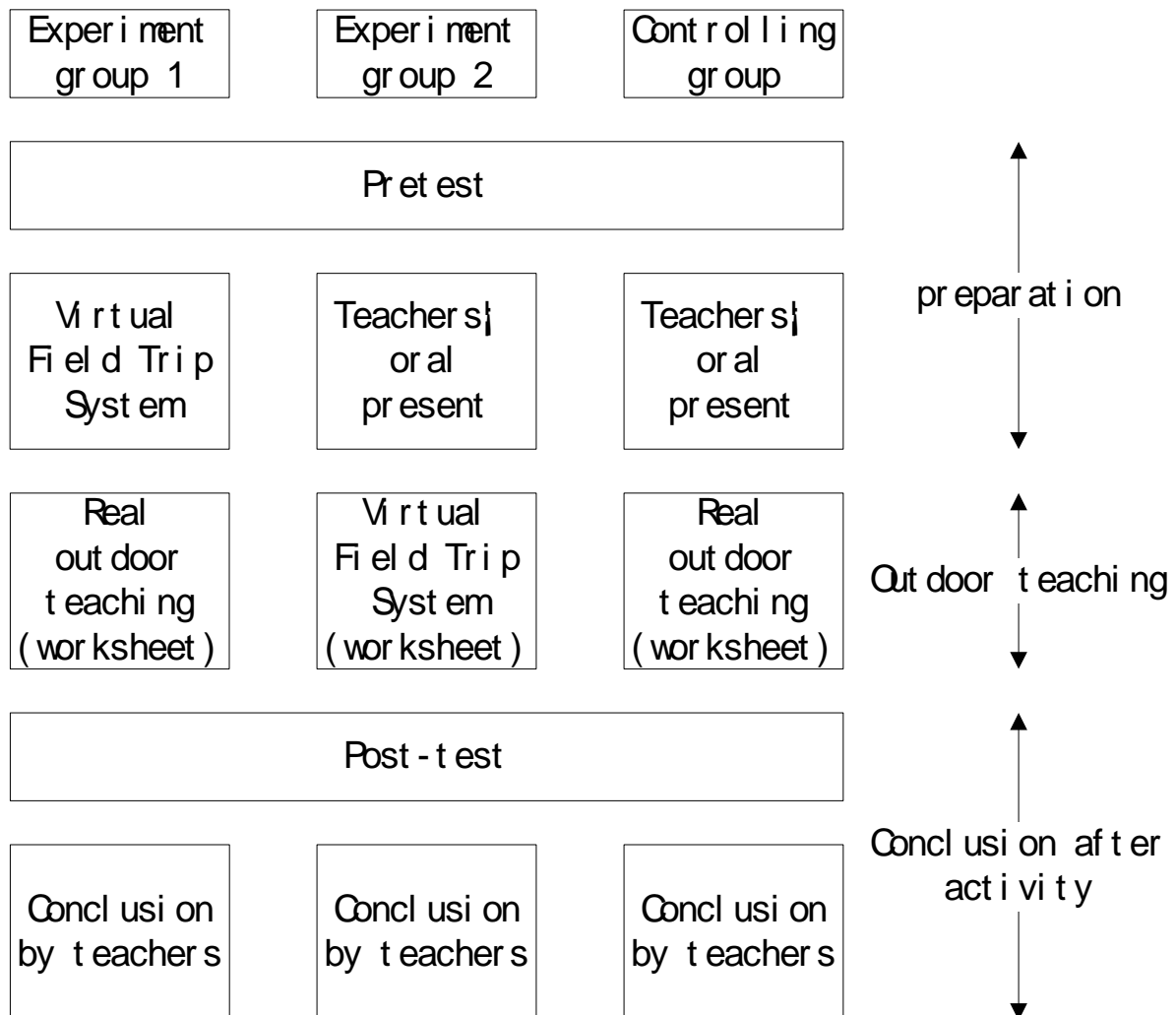


Figure 4-1 experiment procedure

Chapter 5 The Result of Experiment

5-1 Experiment Result Data List

My experiment includes the grades of pretest, post-test and worksheets.

There are 30 questions in every pretest and post-test, including 11 questions of knowledge, 11 questions of comprehension, and 8 questions of application. One question scores one point. The total points are 30. Table 5-1 below lists the sample number (N), average (M), and standard deviation (SD):

Table 5-1 Average and Standard Deviation of pretest and post-test in every group

		N	Knowledge	Comprehension	Application	Total point
			M (SD)	M (SD)	M (SD)	M (SD)
Experiment Group 1	Pretest	26	4.88 (2.03)	5.54 (1.96)	3.77 (1.66)	14.19 (4.69)
	Post-test	26	8.23 (1.58)	6.65 (1.72)	5.12 (1.53)	20.00 (3.82)
Experiment Group 2	Pretest	29	5.14 (1.81)	6.28 (1.75)	3.14 (1.92)	14.55 (4.46)
	Post-test	29	7.45 (2.31)	6.86 (1.77)	4.76 (1.98)	19.07 (5.00)
Controlling Group	Pretest	30	5.33 (1.94)	5.57 (1.48)	3.93 (1.76)	14.83 (4.45)
	Post-test	30	7.00 (2.85)	6.33 (2.23)	5.00 (2.08)	18.33 (6.57)

I also collected the grades of worksheet, there were eight questions in the worksheet, each question evaluate in four level, they are 10 points, 7.5 points, 5 points and 2.5 points, if the student didn't answer the question I marked it zero. The total score of worksheet is 80.

Table 5-2 shows their grades.

Table 5-2 Average and Standard Deviation on grades of worksheet

	N	M (SD)
Experiment Group 1	25	50.40 (13.14)
Experiment Group 2	30	51.17 (8.14)
Controlling Group	29	50.26 (11.83)

5-2 Discussion

1. Compare the difference between virtual field trip and traditional lecturing of teachers:

- Experiment group 1 gets higher grades than controlling group in the “knowledge” questions of Mountain Elephant Test. We can understand students who use the software can easily distinguish the key plants thanks to the vivid situation. That is why they can score high in the most basic “knowledge” questions. However, the reason that they do not get the best points in the whole tests is because that students in the elementary school do not have Nature courses until their 3rd grade and they can’t understand right away the questions needing higher level. So their performance is limited in the questions of “comprehension” and “application”.
- Time limited on operation: students do not have sufficient time to operate the software. We can find out from students’ answers that some parts of students do not understand completely of the contents of the teaching tools, which influences their performance in the questions of “comprehension” and “application”.

2. Compare the difference between virtual field trip system and traditional outdoor teaching: the result of experiment group 2 does not have significant difference with other 2 groups, which allows us to make a conclusion that students using the software have similar learning effect with those practicing outdoor teaching. However, the time limit of the operation of the software influences students’ performance in the post-test.

3. Analysis of the grades from the worksheet

There is no big significance among experiment group 1, group 2 and controlling group. It may be due to the different standard of teachers in every class, even though I have indicated the rules of scores in the worksheet.

Chapter 6 Conclusion and Suggestion

6-1 Conclusion

1. Thanks to the discovery of my research, it is quite practical to use image-based virtual reality with a worksheet at the same time to establish a virtual situation. Besides, their production and technique costs is relatively low, which is suitable for schools to adopt as teaching tools.
2. The students using the software are much motivated than those who have tradition lecturing, and they are more able to make a right observation during outdoor teaching even though the result of the worksheet and post-test is not highly significant.
3. The students using the software for outdoor teaching have similar performance with those practicing traditional outdoor teaching, their performance of post-test is a little bit better than that of traditional outdoor teaching, but is not highly significant.

6-2 Suggestions

1. Have much time to operate the software: we should note that students need much time to adjust themselves of operating the software during outdoor teaching. They need even longer time than real outdoor teaching.
2. Design worksheets properly: worksheets help guide students operate the software so they should be designed properly.
3. Elevate the age range of researching subjects: the subjects in my research (3rd grade students) do not have sufficient ability on scientific sense and on oral and written expression. Sometimes it's rather difficult to understand their thoughts and expressions in the worksheet. So it is my suggestion to elevate the age of researching subjects.
4. The image-based virtual reality does not sufficiently simulate the real situation: image-based virtual reality is based on static images instead of dynamic ones. I hope improve the situation through the development of information technology.
5. "Internetify" future system: due to the limit of bandwidth of Internet, my system can only allow learners to save the teaching tools and worksheets in their computers. I hope there will be a platform installed on internet in the future so as to establish a national learning walkway website.

References

【Part I : English】

- Belanger, F., & Jordan, D. H.(2000). Evaluation and Implementation of Distance Learning: Technologies Tools, and Techniques. Hershey, PA: Idea Group Publishing.
- Bellan, J. M., & Scheurman, G., (1998). Actural and virtual reality:making the most of field trips, Social Education, 62(1), 35-40.
- Blackhurst A. Edward & Morse Timothy E(1996). Using Anchored Instruction to Teach About Assistive Technology. Focus on Autism & Other Development Disabilities, 11(3), 131-142.
- Brandy, S. A.(1997). Some idea for teaching the home state geography course. Journal of geography, 96(5), 264-268.
- Candyce Williams Glaser & Herbert J. Rieth & Charles K. Kinzer & Linda k. Colburn & Jeanne Peter(1999). A Description of the Impact of Multimedia Anchored Instruction on Classroom Interactions. Journal of Special Education Technology, 14(2), 27-43.
- Cenae. Michael & Mitchell P. Judith(1998). Anchored Instruction: A Model for Integrating the Language Arts Through Content Area Study. Journal of Adolescent & Adult Literacy, 41(7), 559-562.
- Disinger, J. F.(1984). Field instruction in school settings. Environmental Education Digest, No. 1, 2-3.
- Ford, P. M.(1981). Principles and Practice of Outdoor / Environmental Education. New York:John Wily & Sons.
- Ford, P. M.(1986). Outdoor Education. Definition ans Philosophy.(ERIC Document Reproduction Service No. ED267941)
- Ford, R.E. & Hipple, J.D.(1998). GeoSystems today: an interactive casebook(http://www.wiley.com/college/ford_test/index.html)
- Fry, H. (1987). Worksheets as museum learning device. Museums Journal, 86(4), 219-225.
- Gilmour, I.(1997). Skiddaw Virtual Field Trip. A study of thermal metamorphism(<http://earth2.open.ac.uk/Skiddaw/Text/Skiddaw.html>)
- Gratton, J.(1997). Virtual field trip(<http://www.aber.ac.uk/~jpg/malta/maltind.html>)

- Hsin-Yih Shyu(1999). Effects of Media Attribute in Anchored Instruction. *Journal of Educational Computing Research*, 21(2), 119-139.
- Hsin-Yih Shyu(2000). Using Video-Based Anchored Instruction to Enhance Learning: Taiwan's Experience. *British Journal of Educational Technology*, 31(1), p57-70.
- Hust, S.D. (1998). Use of "virtual" field trips in teaching introductory geology, *Computers & Geosciences*, 24(7), p653-658.
- J. I. Spicer & J. Stratford(2001). Student perceptions of a virtual field trip to replace a real field trip. *Journal of Computer Assisted Learning*, 17,345-354.
- Klemm, E. B. (2002). Virtual Field Trips: Alternatives to Actual Field Trips. *Int'l J of Instructional Media*, 29(4), p453-468.
- Klemm, E. B. (2003). Virtual Field Trips: Best Practices. *Int'l J of Instructional Media*, 30(2), p177-193.
- Krepel, W. J., & DuVall, C. R.(1981). Field trips: a guide for planning and conducting educational experiences. *Analysis and Action Series*, U.S., District of Columbia, 7-31.
- Michael F. Young & Sasha A. Barab(1999). Perception of the RaisonD'etre in Anchored Instruction: An Ecological Psychology Perspective. *Journal of Educational Computing research*, 20(2), 119-141.
- Michael F. Young(1993). Instruction Design for Situated Learning. *Educational Technology, Research and Development*, 41(1), 43-58.
- Nichols, D.R.(1990)Tactical Environmental Interpretation : A Multisensory Approach.(ERIC/EJ410308)
- Orion, N., & Hofstein, A.(1991). Factors which influence learning ability during a scientific field trips. *Science Education*, 37, 513-523.
- Phipps, L. & Stainfield, J.D.(1998). Heightening the experience: using the Internet to 'virtually enhance' fieldwork, *GeoCal*, 19, 14-16 (<http://www.geog.le.ac.uk/cti/geocal19/secd.html>)
- Phipps, L. & Stainfield, J.D.(1999) Beyond the Maltese Website: lessons learned and new 'Web' horizons, *GeoCal*, 20, 9-11.

Stainfield, J., Fisher, P., Ford, B., and Solem, M.,(2000). International virtual field trips: a new direction? *Journal of Geography in Higher Education*, 24(2), 255-262.

The Cognition and Technology Group at Vanderbilt(1990). Anchored Instruction and Its Relationship to Situated Cognition. *Educational Researcher*, 19(6), 2-10.

The Cognition and Technology Group at Vanderbilt(1997). *The Jasper Project: Lessons in Curriculum, Instruction, Assessment, and Professional Development*. Lawrence Erlbaum Associates, Publishers.

The Cognition and Technology Group at Vanderbilt(1997). *The Jasper Project: Lessons in Curriculum, Instruction, Assessment, and Professional Development*. Lawrence Erlbaum Associates, Publishers. Mahwah, New Jersey.

Tuthill, G., and Klemm, E. B.,(2002).Virtual field trips:alternatives to actual field trips, *International Journal of Instructional Media*, 29(4), 453-468.

Warburton, J. & Higgitt, M.(1997) Improving the preparation for fieldwork with 'IT': two examples from physical geography, *Journal of Geography in Higher Education*, 18(3), 333-347.

Woerner, J. J.(1999). Virtual field trips in the earth science classroom. *Proceedings of the 1999 Annual Inter-nation Conference of the Association for the Education of Teachers in Science, Greenville NC: Association for the Education for the Education of Teachers Science*, 1232-1244.

Wood, J. et al(1997). *Designing a Virtual Field Courses*, Eurographics 97, University of East Anglia, <http://www.geog.le.ac.uk/jwo/research/conferences/Eurographics97/index.htm>

【Part II : Chinese】

- 李崑山 (1993)。戶外教學活動單設計思考模式。環境教育季刊，18 期，頁 61-67。
- 李崑山 (1995)。國民小學校園環境教學步道規劃設計。環境教育，25 期，頁 38-48。
- 李崑山 (1996)。國民小學戶外教學理論與實務初探。環境教育，29 期，頁 62-69。
- 周儒、呂建政譯 (1999)。戶外教學。台北市：五南。
- 林俶圭 (1995)。環境教育的希望工程從社區的「自然步道」出發。自然保育教育研討會專集。行政院農業委員會，頁 197-205。
- 徐新逸 (1995a)。「錨式情境教學法」教材設計、發展與應用。視聽教育雙月刊，37 卷 1 期，頁 14-24。
- 徐新逸 (1995c)。如何借重電腦科技來啼聲問題解決的能力？談「錨式情境教學法」之理論基礎與實例應用 (上)。教學科技與媒體，20 期，頁 25-30。
- 徐新逸 (1995b)。如何借重電腦科技來啼聲問題解決的能力？談「錨式情境教學法」之理論基礎與實例應用 (下)。教學科技與媒體，21 期，頁 47-51。
- 耿志華 (1995)。台北縣國民小學實施戶外教學初探。國民教育，35 期，頁 32-36。
- 陳忠照 (1995)。如何規劃校園環境步道教學活動。國民教育，35 卷 8 期，頁 2-7。
- 楊志誠 (1993)。國中教師戶外環境教育現況與障礙之研究。國立台灣大學地理研究所碩士論文。
- 謝鴻儒 (2000)。國小教師戶外教學現況與障礙之研究。國立台北師範學院課程與教學研究所碩士論文。
- 蘇禹銘 (1998)。淺談國小自然科戶外教學。屏師科學教育，7 期，頁 49-61。

Author Note:

Chiu, Po-han (邱柏翰), was born on August 24, 1976 in Taipei, Taiwan, Republic of China. He received the B.S. degree in Management Information System from National Chengchi University in 1999 and the M.S. degree in Information and Computer Education from National Taiwan Normal University in 2004. He has been a second lieutenant of R.O.C from 1999 to 2001. From 2004, He works as a computer teacher and teacher librarian in Lo-tung Senior High School. Last year, he presented the paper "The Design and Development of an Online Knowledge Base for Librarians" in 2005 IASL conference, Hong Kong.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.