

國立交通大學

資訊科學系

碩士論文

經由概念圖觀摩和互連輔助自我覺察



The Concept Map Modeling and Interconnection do Help

Promote Self-awareness

研究生：鄭喬文

指導教授：孫春在 教授

中華民國 九十二年 六月

經由概念圖觀摩和互連輔助自我覺察
The Concept Map Modeling and Interconnection do Help Promote
Self-awareness

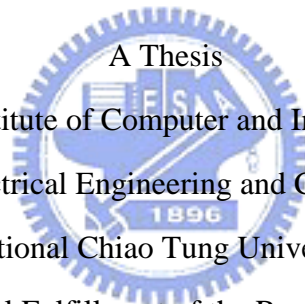
研究生：鄭喬文

Student : Chiao-Wen Cheng

指導教授：孫春在

Advisor : Chuen-Tsai Sun

國立交通大學
資訊科學系
碩士論文



A Thesis
Submitted to Institute of Computer and Information Science
College of Electrical Engineering and Computer Science
National Chiao Tung University
in partial Fulfillment of the Requirements
for the Degree of
Master
in
Computer and Information Science

June 2005

Hsinchu, Taiwan, Republic of China

中華民國九十四年六月


經由概念圖觀摩與互連輔助自我覺察

學生：鄭喬文

指導教授：孫春在 教授

國立交通大學資訊科學系碩士班

摘要



本研究主要是透過建構概念圖的方式，來探討同儕互評所給予的回饋是否有助於自我覺察的發展為討論的主體。透過社會心理學中的「鏡中自我」(Looking-Glass Self)理論，利用在網路的環境下，讓學生經由概念圖建構系統觀摩其他同儕的概念，並自行選擇對象相互連接、評選，進而修改。利用同儕間透過相互的評選的過程中得到的回饋，觀察學生在得到的不同的回饋品質對自我覺察能力的影響，以及重視同儕間的評語程度對自我覺察程度的影響。

根據實驗分析結果，除了證明本研究的模組架構可以檢視自我覺察的程度之外，更可證實，高品質的回饋對自我覺察的提升越有幫助，對於同儕給的評語也越在意往往都是屬於高覺察能力者。經過同儕的回饋的作用，學生在課程概念上的自我覺察程度均有明顯的提昇，也證實了利用概念圖建構的方式對部份學生覺查對課程概念的不足是有幫助的。

關鍵詞：回饋、概念圖、同儕互評、後設認知、自我覺察

The Concept Map Modeling and Interconnection do Help Promote Self-awareness

Student : Chiao-Wen Cheng

Advisor : Dr. Chuen-Tsai Sun

Institute of Computer and Information Science

National Chiao Tung University

ABSTRACT

This research, conducted mainly through constructing concept maps, seeks to probe whether or not the given feedback of peer-assessment can facilitate the development of self-awareness. Through the theory of Looking-Glass Self, placed in the Internet environment, students are asked to observe others' notions by concept maps construction system, then freely choose one to interconnect, elect, and modify. The feedback in the process of peer-assessment are used to inspect the influence on each student's self-awareness ability as they get different qualities of feedback, and how much their valuing the peer-judgments influences their levels of self-awareness.

According to the analytic result of experiment, the modular framework of this research do help to survey the level of self-awareness; what's more, the high-quality feedback are more likely to boost self-awareness. Also, those who comparatively care more about peer-assessment belong usually to the highly aware group. By way of feedback from peers, students' levels of self-awareness are evidently elevated, which at the same time proves that it is rather helpful to use concept maps construction to help students realize their lack of concepts in the curriculum.

Keyword:concept maps , feedback , peer-assessment , meta-cognition , self-awareness

誌謝

「謝天謝地」讓我能有榮幸從交通大學資訊科學系碩士班畢業，對我這個半路出家的門外漢來說是十分的不易，更是人生的一大轉折點。首先最要感謝的是永遠敞開大門給我無限支持的爸爸、媽媽、弟弟和妹妹，希望未來我的家人們能以為為榮。接著要感謝孫春在老師，無論在研究指導或人生見解上給我的建議都讓人有「聽君一席話，勝讀十年書」的感觸。

還要感謝林珊如老師在問卷上給我的許多建議，以及王淑玲和曾憲雄老師在口試時給我的指教。另外，要感謝宜敏學姊在這段期間不記辛勞慷慨激昂的協助，還有謝謝一路互相扶持的實驗夥伴冠傑。除此之外，在研究上還要感謝岱伊、佩嵐、崇源、士鋒等學長姊的幫忙；在課業上更要感謝宗瀚、偉智、吉隆、王翔學長以及實驗室的同窗成員端木、其煜、東鴻、敬華、家胤、仁鴻、健銘、冠傑對我熱情的協助，讓我能夠順利 all pass 完成碩士班的學業；在生活上特別要感謝一年情誼的室友璧如學姊、端木和身同處境的組友瓊琬，讓我在總是無法久留的新竹生活添加不少樂趣。謝謝所有曾經幫助我、成全我以及給我祝福的人，謝謝你們!!

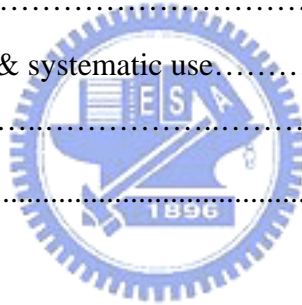
最後要謝謝恬和迷，謝謝妳們一直以來給我的信任及鼓勵，我會繼續努力朝人生理想目標的下一站前進!!

Contents

Abstract (in chnese).....	i
Abstract (in English).....	ii
Acknowledgement(in chinese).....	iii
Contents.....	iv
List of Tables.....	vi
List of Figures.....	vi
1.Introduction.....	1
2.Background.....	2
2.1 Self-Awareness.....	2
2.1.1 Looking-Glass Self.....	3
2.1.2 Meta-cognition.....	3
2.2 Feedback.....	4
2.3 Peer-assessment.....	6
2.4 IMPROVE.....	7
2.5 Concept Maps.....	7
2.5.1 Sharing Concept Map	8
3. Method.....	9
3.1 Participants.....	9
3.2 Models.....	9
3.2.1 The model of modeling and interconnection design	9
3.2.2 Assessment design	10
4. Result.....	12
5. Conclusion.....	21
References.....	23

Appendix Contents

Appendix A Background.....	26
Self-awareness.....	26
IMPROVE.....	27
Concept maps.....	27
Appendix B Method.....	28
IMPROVE reliability & validity analysis.....	28
concept map and peer judge.....	32
peer feedback.....	33
survey of interconnection & systematic use.....	34
Appendix C Systematic.....	34
References.....	35



List of Tables

Table 1. cluster analysis on levels of self-awareness.....	13
Table 2. Results from Kappa analyses of the three experts' evaluations.	14
Table 3. IMPROVE pre-test and post-test on receiving high-quality feedback.....	15
Table 4. IMPROVE pre-test and post-test on receiving poor-quality feedback.....	15
Table 5. IMPROVE pre-test and post-test on value feedback.....	17
Table 6. IMPROVE pre-test and post-test on unvalue feedback.....	18
Table 7. Results from statistical tests on scores on pre-test and post-test questionnaires.....	19
Table 8. statistics of people's number on the first choice of interconnection on level of awareness.....	20
Table 9. statistics of people's number on the second choice on level of awareness.....	20

List of Appendix Tables

Table 1. IMPROVE Item analysis.....	28
Table 2. IMPROVE Reliability.....	30
Table 3. IMPROVE factor analysis.....	31
Table 4. concept map×peer judgment.....	33
Table 5. concept map×peer judgment.....	33
Table 6. peer feedback.....	33
Table 7. Survey of interconnection & systematic user.....	34

List of Figures

Figure1.modeling and interconnection.....	10
Figure 2. methods used in the study.....	11
Figure 3. statistics of people's number on different levels of feedback quality and self-awareness.....	16
Figure 4. degree of valuing the feedback.....	19
Figure 5. systematic users suver percentage of people.....	21

List of Appendix Figures

Figure1. concept map study web.....	34
Figure 2. concept map class.....	35
Figure3. concept map class.....	35
Figure 4. concept map Systematic.....	36

The Concept Map Modeling and Interconnection do Help Promote Self-awareness

1. INTRODUCTION

Based on the theory of “Looking-glass self” in social psychology, people learn to understand themselves through the feedback that shows how others look at them (Cooley, 1902; Mead, 1943). Peer-assessment is exactly a method that adopts peer feedback to understand oneself through social interaction. Peer-assessment not only positively affects the academic accomplishment and learning attitudes of students, but also improves the qualities of learning. From the assessor’s perspective, having to grade and comment on others’ works enables them to see their own shortcomings better; from the examinee’s point of view, the comments and suggestions received from peer assessment can work as good reference, thus help them to revise the assignments and accumulate their achievements (Lin, Cho, Liu & Yuan, 2000). However, does it conclude that the level of feedback given through peer assessment efficiently helps to find out one’s own deficiencies and take critiques well to improve oneself? This is just what this research tends to probe into.


This research, conducted in the Internet environment, capitalizes the concept maps construction system to mutually observe each other’s concept maps, thus interconnect and comment on each other to achieve peer assessment. The concept maps, besides being the material of personal knowledge establishment and device for inspiring thinking and cognition (Henderson, 1991), are also proved to help students in meaningful learning (Roth & Roychoudhury , 1992). Furthermore, concept maps can be used to examine the accuracy of one’s own notions. On the other hand, through the meta-cognition of Mevarech & Kramarski’s (1997a) developing IMPROVE mold, a survey aimed at comprehension,

connection, strategic, reflection, is designed in relation to the experiment theme and used to test students' levels of self-awareness in this activity.

All in all, the primary goal of this research aims to comprehend how the qualities of peer feedback affect the ability of self-awareness. In the next place, it is to assess how much one's placing importance on peer feedback can influence their level of self-awareness. Third, it attempts to prove that using the concept maps to mutually assess does help one to realize his own concept deficiency.

2. BACKGROUND

2.1. Self-awareness



Self-awareness, as defined, describes a person being aware of the state in which he devotes attention to himself (Duval & Wicklund, 1972). Through many studies it is indicated that self-awareness can increase one's knowledge of himself. In 1995, Aronson once proposed, among the methods of understanding oneself, adopting "social interaction to know oneself" (for more details see the appendixA). Social interaction plays an important role in self-development concept, for very often we gather information concerning ourselves through others' critiques or reactions to us. Aronson and others alike also point out that, if we can't look through other people's eyes at ourselves, our self-awareness will become quite vague, because then we won't be able to examine ourselves in the viewpoint of this society. This also proves that others' expectation not only influence our behaviors, but also affect our egos. Festinger (1954) once indicated, in his social comparison theory, that people's thoughts and feelings of themselves oftentimes come from their comparison with others. According to some researches, comparing with one's own equivalents signifies a lot more in shaping one's

ego, and possesses more potency. Through the above-mentioned statement, we can conclude that self-awareness and social interaction are very closely related to each other.

2.1.1 Looking-Glass Self

In 1902 sociologist Cooley, by way of “the Looking-Glass Self”, pointed out that our definitions of ourselves construct according to others’ reactions and judgments. Cooley also mentioned that a person’s ego is generated through his interpersonal reactions and relationships, that others are like a mirror which can reflect oneself. ”We have a tendency to become the person others say we are,” Cooley said. In other words, we tend to take other people’s opinions of us as an important reference of self-judgment. And through the process of self-establishing by social interaction, we internalize others’ critiques once we realize how they think of us. Some subsequent research also indicated that, the ability to accept others’ points of view is one vital step to forming one’s ego. The Looking-Glass Self shapes as long as we constantly accept what others think of us. Therefore, the process of our forming egos includes both social interaction and self-examination. And from the Looking-Glass theory we know that the information source of our self-interpretation or self-awareness comes mainly from other people’s modelings and feedback. Then we take these feedback to reflect and meditate in order to achieve self-awareness.

2.1.2 Meta-cognition

Meta-cognition is a special process. Flavell(1976) regards it as active monitoring and consequent regulation of personal cognitive process, and the orchestration of all the cognitive procedures. Brown(1987) considers meta-cognition the knowledge of knowing one’s own thinking as well as learning activities and knowing how to adjust or control; in other words, a person not only understands his/her cognitive condition, but also knows how to manage

himself. From the angle of meta-cognition learning, meta-cognition is the cognition of a person's cognitive process. The self-control of the learning may be called self-regulated learning, which depends on a profound self-awareness process to monitor oneself correctly, thus promotes the learning to be effective.

Self-regulated learning is a self-oriented feedback circle. The learners adopt different methods, from internal self-awareness to external behavior alterations, to survey the effectiveness of his learning method and strategy. This circle is a recurring process. (Zimmerman, 1986) This accounts for the fact that, self-awareness is considered the crucial factor in a learner's learning process of self-regulated or meta-cognition. What's more, how learners boost their learning of self-regulated through self-awareness process is also viewed as the key point. In the social learning theorist Bandura's (1978) triadic theory of learning, he thinks that a person's learning is the interacting and inter-influencing result of the three: social environment, personal cognition on environment, and personal behavior. Furthermore, Bandura adopts the concepts of model learning and modeling to account for the learning method.

In conclusion, this research will be adopted to probe into self-awareness in the fields of Looking-Glass Self and meta-cognition theory, which are developments in social interaction relationship. Thus, the research focuses especially on the relationship between the feedback and self-regulated learning in learning interaction.

2.2 Feedback

Schmidt(1982) regarded feedback as a message relating to action results, or an external stimulus during or after a personal reaction. The meaning of feedback is often the examinee's

understanding of the reaction results. It can also be regarded as a verbal, final action, or exterior feedback. Cohen (1985) defined feedback (in the field of computer-assisted teaching) as the message that appears after the learner has given an answer. Nadler (1977) furthermore indicated that, feedback can influence behaviors, the reason being feedback possesses the functions of “stimulation” and “indication”. Generally speaking, feedback can not only stimulate one’s behaviors through different convictions, (for instance, self-assessment and a third-person assessment) but also influence one’s behaviors through interior or exterior rewards. (Giving the assessment results back to the person as a feedback, in order to assist him/her to understand themselves, is also called a reward.) Feedback is not merely a right-or-wrong thing; it could encompass all kinds of reactions. What’s more, feedback can elevate learning results; its functions in this aspect are as followed. 1. Providing learners with messages. 2. Enhancing the learners’ motives and attentions. 3. Producing more participations, thus elevating the learning results. 4. Arousing conflicts and disagreements, in order to construct knowledge and cognitive success. (Dempsey, Scales , 1993) Park & Gittelman (1992) have listed three methods of feedback in computer-assisted learning: explanatory feedback(which offers explanatory contexts and instructions), informing results(which only notifies the results but does not provide detailed explanations), and natural feedback. (which provides learners with graphs and lets them observe the results on their own; it doesn’t make any written explanations nor inform results) According to previous researches, feedback has a big impact on learners. Thus, this research will combine the concept map systems with Park & Gittleman’s (1992) three methods of feedback to be the basis of obtaining feedback, then altogether we’ll inspect the influences of feedback qualities on self-awareness.

2.3 Peer-assessment

According to documents, the definition of “peer-assessment” is as follows: students, who

are in the same grade and of the same background, escape beyond the role of learning and attempt to evaluate their classmates from an instructor's point of view (Sluijsmans , Dochy & Moerkerke , 1999). Peer-assessment is undertaken through learning activities in the curricula, and its evaluation or comparative critique is pursued by way of peer assessment on the success of mutual works and learning achievements. Through the process of peer-assessment, the criteria of the assignments may very well be concluded after the students have studied others' works and accepted their suggestions. In this case, peer-assessment not only positively affects the academic accomplishment and learning attitudes of students, but also improves the qualities of learning. From the assessor's perspective, having to grade and comment on others' works enables them to see their own shortcomings better; from the examinee's point of view, the comments and suggestions received from peer assessment can work as good reference, thus help them to revise the assignments and accumulate their achievements (Lin,Cho,Liu&Yuan,2000).Therefore, peer-assessment undoubtedly reaches the effect of direct reinforcement. The learners can also consciously make self-assessment according to the self-established code of conduct. This conforms to the self reinforcement put forward by Bandura (1986) in the social learning theory.

According to Cooley and Mead's statement of Looking-Glass Self, people understand themselves by others' feedback and what others consider them to be. Also, due to the lack of objective standard of self-assessment, we tend to depend on others' judgments to identify ourselves (Connor & Dyce, 1993). Thus, the best way to obtain feedback and achieve self-assessment is to adopt peer-assessment. Thus, this research focuses mainly on the relationship between self-awareness and how much one values his feedback.

2.4 IMPROVE (IMPROVE meta-cognition model)

Aiming at the meta-cognition enlightenment , Mevarech & Kramarski(1997)have developed the IMPROVE model (for more details see the appendixA) . IMPROVE is the description of the teaching or learning process: Introducing New concepts, Meta-cognitive questioning , Practicing , Reviewing , Obtaining mastery , Verification and Enrichment . Furthermore , it is a diversified model which mainly aims at comprehension , connection , strategic , reflection to proceed questioning in the learning process . Through the students' responses , not only can we realize their learning conditions, but the students will also comprehend more about the curriculum. Through these questionings, students can also know more about their own learning condition, thus achieve the effect of meta-cognition (Kramarski & Ritkof ,2002). Hence, this research bases on the four aiming perspectives of IMPROVE model to design its questionnaire, which will be used to evaluate and discuss on the level of students' self-awareness of their curricula comprehension.



2.5 Concept maps

Constructionists Novak & Gowin (1984) proposed displaying or portraying our minds through concept maps in assistance to teaching and learning. The concept maps, besides being the material of personal knowledge establishment and device for co-discussion and inspiration of thinking and cognition (Henderson, 1991), are also proved by Roth & Roychoudhury (1992) to help students in meaningful learning. So this research seeks to enhance students' cognition on curricular concepts by constructing personal concept maps. In addition, the method of modeling and interconnection will be adopted to enable sharing of concepts, while peer-assessment can, based on concept maps construction raised by Novak & Gowin(for more details see the appendixA) , give judgments to the connectors, thus obtain peers' feedback.

2.5.1 Sharing Concept Map Construction

According to Kao's (2001) learning module method of collaborated competition, to share through the Internet the personal concept maps of different units in the construction curriculum and to choose by oneself the partner to interconnect, altogether assist the students to have a more complete integration of all the concepts of the whole teaching materials and units. It is the same with Steiner's (1972) division of labor in "liberal combination contribution", in which the members can freely search for their own partners instead of being assigned or appointed; for choosing one's own beloved partner can avoid unhealthy cooperative interaction behavior."Knowledge is built upon the social common views" (Roth & Roychoudhury, 1992). This knowledge comes from learners from a certain learning group and is later constructed upon the social interaction stage in which this group of people coordinate, communicate, modify, and so forth. The alike social interaction is the threshold of cooperative learning.



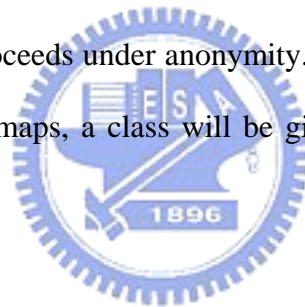
Despite the fact that through social interaction, cooperative learning has reached quite positive learning effects, it can't be promised that every student succeeds in operative learning. More research has pointed out that, cooperative learning on the Internet cannot affirm whether a student has fulfilled his responsibility (eg. Sun & Chou, 1996), for the cooperation part, taken place in collaborated competition learning through concept maps, can be done after the knowledge construction has been done, instead of in the learning process itself (Lin & Sun & Kao,2002) .Thus in this research, this kind of notion is adopted to achieve the collaborated competition effect by sharing concept map construction. Nevertheless, Kao's collaborated competition method of learning to share construction concept maps equals merely choosing the partner; one can not receive much peer feedback through it. In view of this, the research has refined the cooperation method, modifying it into a two-way mode of choosing partner, in

which both individuals have to consent to continue their cooperation. That's why this research can furthermore accomplish the social interaction of peer feedback by modeling and interconnection.

3 METHOD

3.1 Participants

Altogether there are 72 students participating in this research, all of them undergoing an experimental course of multi-media animation. The students are divided into three groups, in which they shall respectively establish a personal concept map of the designated unit after the curriculum. In order to diminish the external interference, the whole process of modeling and interconnection experiment proceeds under anonymity. Besides, in order to enhance students' understanding of the concept maps, a class will be given beforehand to teach them how to construct concept maps.



3.2 Models

3.2.1 The model of modeling and interconnection design

The following is the statement of modeling and interconnection constructional model in concept maps system(Figure.1). The teaching method is divided into three units, and each student should construct his own concept map in accordance with his appointed lesson. After completing his own, each student shall observe all the others' concept maps through the system, make a comparison and judgment in another two units and pick a person as the choice to do the concept interconnection. The Choice will determine whether to interconnect with the chooser or not by the quality of the chooser's concept maps, furthermore give comments on the concept maps. If the Choice denies concept interconnecting with the chooser, the chooser

has to find in the same unit a willing substitute, revise his own constructed concept map on the basis of the integration of concept interconnection, then go through the modeling and interconnection again to pick a second Choice. For example, A1, who constructs his concept map in Unit 1, chooses B2 in Unit 2 as his choice 1 and C12 in Unit3 as his choice 2. C12 in Unit3 consents to interconnect with A1 on the concept maps and gives some comments on A1's concept maps. But B2 in Unit 2 considers A1's concept maps to be of poor quality and refuses to interconnect with him, and B2 also comments on A1's concept maps. In this case, A1 has to choose B12 in Unit2 to be his Choice 1. Accordingly, everyone needs to pick out concept maps from two different units to do the concept interconnection and join them into a complete curricular cognition construction. Then, modify his own concept maps according to the concept combination and the feedback from peers. Finally, make again a choice to do concept interconnection in the second round of modeling and interconnection.

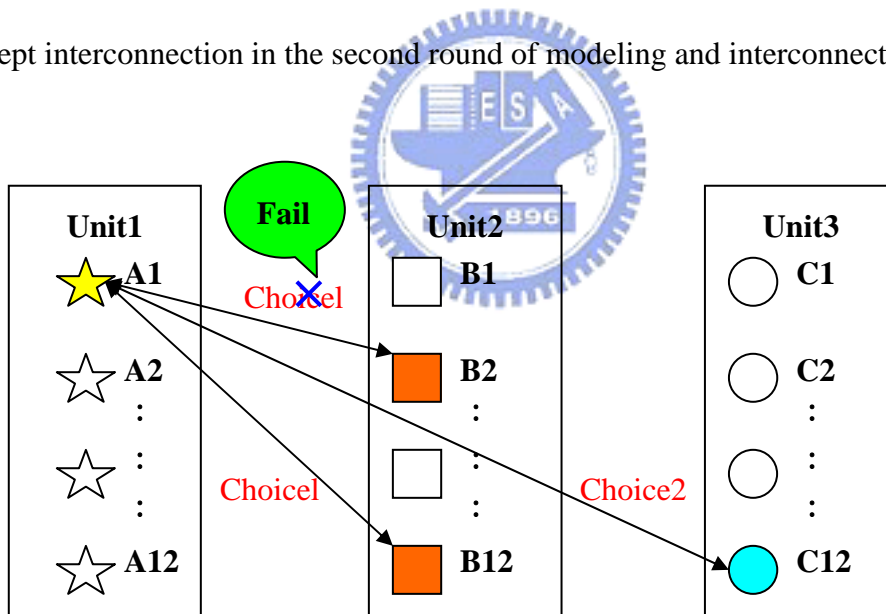


Figure.1 : modeling and interconnection model

3.2.2 Assessment design

To achieve the target of this research, five phases have been devised in this experiment(Figure.2): (a) IMPROVE pre-test, (b) peer judgment, (c) peer feedback, (d)

survey of interconnection & systematic user, (e) IMPROVE post-test. The experiment time totals a succession of four weeks, three hours within each week.

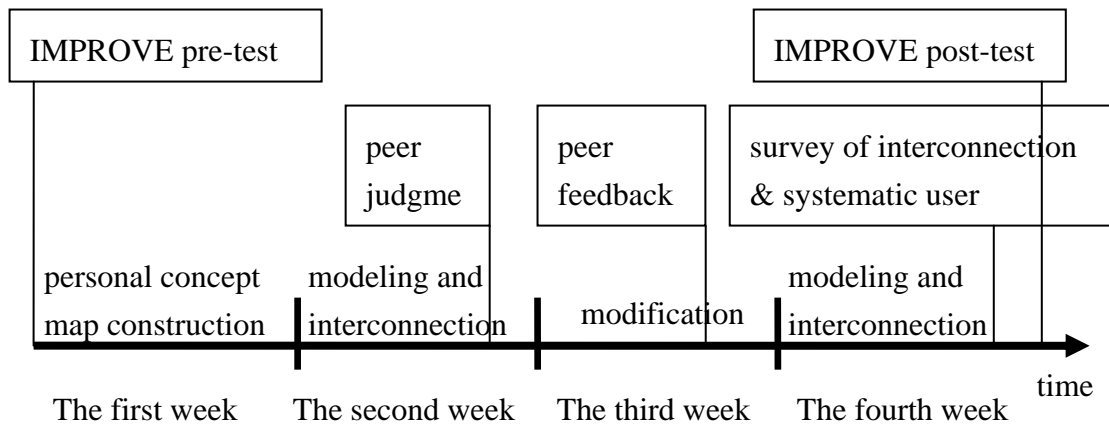


Figure.2: methods used in the study

The IMPROVE meta-assessment utilized in this research has adopted the four perspectives of meta-cognition put forward by Mevarech & Kramarski (1997), together with the curriculum, to design its questionnaire. Each perspective has eight related questions, which are used to find out and assess the students' level of awareness on curricular concepts. For example: 1. Comprehension: Have you ever thought of the terms for constructing Flash concept maps? 2. Connection: Have you ever thought of the correlation between ActionScript and programming? 3. Strategic: Have you ever considered how to edit ActionScript? 4. Reflection: Have you ever thought of referring to others' concept maps in order to introspect your own for improvement? To assess the reliability of this whole measurement, we use Crobach's α coefficient to execute an internal unanimous reliability analysis. The results of the analysis are respectively .8736. Besides reliability analysis, we also adopt factor analysis to measure the validity (see the appendixB for details).

In the first stage of modeling and interconnection, we employ giving peer judgment to

achieve peer inter-grading. As for the standard, we adopt “Novak and Gowin’s concept map construction” to undertake an open-ended questioning, in order to prevent students from scrawling the concept maps or sloppily giving out judgment. For the curricular achievements, there will also be a grading part on personal concept maps and peer judgment(see the appendixB for details). After modifying concept maps in the second stage, we use peer feedback examination to assess how much the students have gained through peer feedback. There are two parts in this examination: 1. To know the quality of modeling and interconnection. For instance, “Did I make my choice according to his/her ability of ‘Novak and Gowin’s concept map construction’?” 2. To understand how much the students care about feedback. For instance, “I will modify my own concept maps because my classmates’ judgment tells me to do so?” They are respectively asked in an open-ended way (see the appendixB for details). Finally there will be three experts to judge the quality according to the answers to above-mentioned examination. The third stage, the survey of modeling and interconnection & systematic user, investigates in a closed method (see the appendixB for details) , hoping to understand if students will change their choices in the second interconnection, for example, “Are your second choice and first choice the same person?”, and to know if using the system is helpful to the students and their points of view on it, like “Do you think it helpful for integrating the concepts by model and interconnecting with your peer’s concept maps?”

4 RESULT

The research primarily aims to adopt two stage method to do the cluster analysis on students’ IMPROVE pre-tests. In the first phase, Ward’s least variation in the ordering cluster analysis is adopted to determine the suitable numbers of group dividing. Through the coefficient resulted from population- concentrated, we figure out that when the divided groups

number three, it is most reasonable. Thus, this research distributes the level of self-awareness into three groups. In the second phase, we have adopted K-means method, which is more commonly used in non-ordering sub-cluster analysis, to discuss the efficacy of the variations. In order to judge the effect of cluster analysis and confirm the grades of the three self-awareness groups, we use three more clusters as the independent variables to respectively undertake MANOVA, under the four aspects of IMPROVE .(Table.1)

After Duncan's multiple test, we've found that the four aspects in three clusters are all distinctive. Among them, cluster one gets the highest average value in all aspects, which means cluster one behaves the best in all aspects among the three. We therefore name cluster one as the highly-aware group; on the contrary, cluster two gets the lowest average value, thus is named the low-aware group. Cluster three gets the neutral average value, and becomes the medium-aware group.

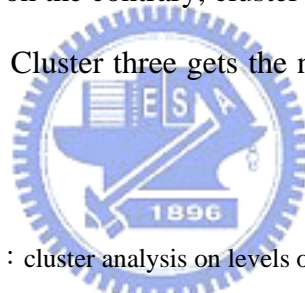


Table1 : cluster analysis on levels of self-awareness

IMPROVE	cluster one	cluster two	cluster three	MANOVA		Duncan multiple test
				value of F	value of P	
comprehension	1.136	-1.024	0.076	61.169	.000***	(1,3,2)
Connection	1.360	-1.047	0.038	94.183	.000***	(1,3,2)
Strategic	1.164	-1.092	0.149	75.152	.000***	(1,3,2)
Reflection	1.265	-1.027	0.034	74.024	.000***	(1,3,2)
name of cluster	highly-aware	low-aware	medium-aware			

The numbers are the average of factor scores(standardized values) *P<0.05 **P<0.01 ***P<0.001

1. The influence of peer-feedback’s quality on self-awareness ability

The research takes the artificially assessed qualitative to analyze the relationship between feedback quality and self-awareness. There will be three specialists assessing the quality of peer-judgment and peer-feedback, then classifying all into high-quality feedback and poor-quality feedback. Before the analysis, we took a consistent inspection on the three specialists’ assessment result. Adopting Kappa analysis, we can observe that all specialists possess significance(Table2). Thus, we know that these three specialists’ grading possess consistency, so we can pick out the majority of the same grades to do analysis.

Table2 : Results from Kappa analyses of the three experts’ evaluations

	Kappa	significance
Expert1×Expert 2	.641	.000***
Expert 2×Expert3	.827	.000***
Expert 3×Expert1	.403	.000***

*p<.001

After obtaining specialists’ consistent gradings, we do the analysis according to the assessed quality. First of all, t-test is to compare the differences of the feedback quality between IMPROVE pre-test and post-test. From Table.3 we may clearly observe that in high-quality feedback, there is distinctive unlikeness between IMPROVE pre-test and post-test. Of the four aspects, post-test gets higher average grades than pre-test. Thus in this research, we may declare that, obtaining high-quality feedback can help boost the self-awareness ability. As for Table.4, the poor-quality part, only the aspect “Reflection” is distinctive among the four. What’s more, in the “Comprehension” aspect, the average grades of post-test are lower than those of pre-test. Thus we may also say that, getting poor-quality

feedback doesn't do much to boost one's self-awareness.

Table3 : IMPROVE pre-test and post-test on receiving high-quality feedback

Test items	high-quality feedback				
	IMPROVE		IMPROVE		t
	pre-test		post-test		
	M	SD	M	SD	
Comprehension	3.108	0.567	3.415	0.517	-3.327***
Connection	3.101	0.622	3.318	0.605	-3.024***
Strategic	3.087	0.611	3.232	0.574	-2.315**
Reflection	3.297	0.501	3.506	0.528	-3.012***

*p<.05 **p<.01 ***p<.001

Table4 : IMPROVE pre-test and post-test on receiving poor-quality feedback

	poor-quality feedback				
	IMPROVE		IMPROVE		t
	pre-test		post-test		
	M	SD	M	SD	
Comprehension	3.261	0.567	3.015	0.517	0.076
Connection	3.015	0.328	3.019	0.705	-1.375
Strategic	3.608	0.462	3.621	0.771	-1.464
Reflection	3.263	0.511	3.461	0.534	- 2.315**

*p<.05 **p<.01 ***p<.001

Besides, according to the result of cluster analysis, we calculate the numbers of people on the judgment and feedback quality that they gave and received. By this we discovered that what the high-aware people give or receive are mostly of high quality. Therefore we may conclude that the highly-aware usually give their peers high-quality feedback, and vice versa. The low-aware people only get a bit higher quality on receiving peer judgment. As for giving peer judgment and receiving peer feedback, they are of poorer quality. Therefore we may conclude that the low-aware usually give their peers low-quality feedback, and vice versa. As to the medium-aware group, they get more high-quality than poor-quality, but not much higher(Figure.3).

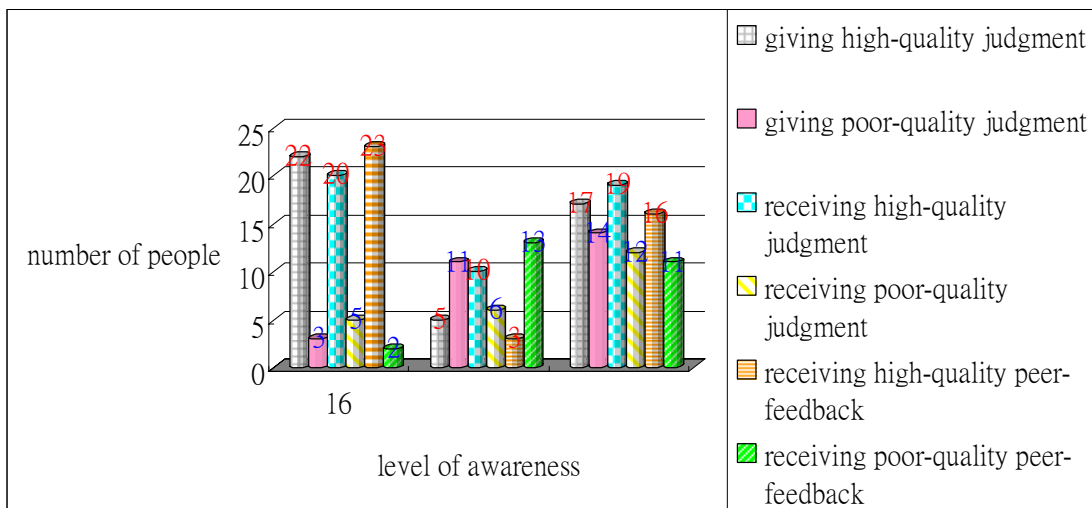


Figure3.statistics of people’s number on different levels of feedback quality and self-awareness

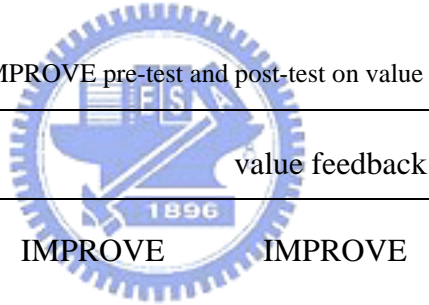
3. How the level of valuing peer-feedback influences the level of self-awareness

The research takes the artificially assessed qualitative to analyze the relationship between the level of valuing peer-feedback and self-awareness. There will be three specialists assessing the quality of peer-feedback survey, then classifying all into “value” and “unvalued”. Before the analysis, we took a consistent inspection on the three specialists’ assessment result. Adopting Kappa analysis, we can observe that all specialists possess significance(Table.5). Thus, we know that these three specialists’ grading possess consistency, so we can pick out

the majority of the same grades to do analysis.

First of all, t-test is to compare the differences of the level of valuing peer-feedback between IMPROVE pre-test and post-test. From table five we may clearly observe that in the “value” group, there is distinctive unlikeness between IMPROVE pre-test and post-test. Of the four aspects, post-test gets higher average grades than pre-test. Thus in this research, we may declare that, valuing peer-feedback can help elevate the self-awareness ability. As for table six, the “unvalue” part, all the four aspects in IMPROVE didn’t reach significance, both on pre-tests and post-tests. Thus we may say that, unvaluing peer-feedback doesn’t do much to boost one’s self-awareness.

Table5 : IMPROVE pre-test and post-test on value feedback



	IMPROVE		IMPROVE		t
	pre-test		post-test		
	M	SD	M	SD	
Comprehension	3.432	0.496	3.803	0.503	-2.787***
Connection	3.213	0.487	3.406	0.509	-2.625***
Strategic	3.359	0.623	3.662	0.582	-3.215**
Reflection	3.176	0.548	3.363	0.563	-3.059***

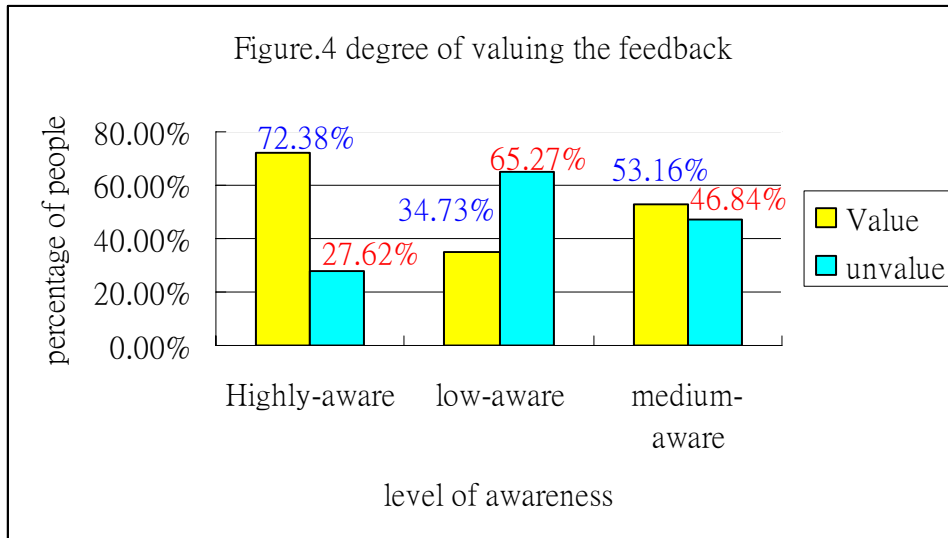
*p<.05 **p<.01 ***p<.001

Table6 : IMPROVE pre-test and post-test on unvalue feedback

	unvalue feedback				
	IMPROVE		IMPROVE		t
	pre-test		post-test		
	M	SD	M	SD	
Comprehension	3.202	0.357	3.215	0.507	-1.548
Connection	3.215	0.486	3.087	0.853	-1.473
Strategic	3.503	0.362	3.517	0.687	-1.589
Reflection	3.532	0.332	3.541	0.734	- 1.342

*p<.05 **p<.01 ***p<.001

According to the result of cluster analysis, we research on the relationship between degree of valuing feedback and self-awareness. We discovered that among the highly-aware people, there are 72.38% of people valuing their peer-feedback, which is much more than the unvaluing 27.62%. On the contrary, only 34.73% of the low-aware people value peer-feedback, much fewer than the unvaluing 65.27%(Figure.4). So we may infer that most highly-aware people do value the received peer-feedback, while the low-aware people mostly unvalue them. The medium-aware group diverges more averagely on “value” and “unvalue”.



3. Concept map modeling and inter-assessment can boost self-awareness.

We use t-test to analyze the IMPROVE tables to compare each student's pre-test and post-test. From the table below we can observe that the students' scores on comprehension, connection, strategic, and reflection all reach significance. Also, the averages in the post-tests are all higher than those in the pre-tests. So we may say in this research that, receiving feedback through concept map modeling and inter-assessment can truly boost the ability of self-awareness, especially improve the aspect of reflection (Table.7).

Table.7 : Results from statistical tests on scores on pre-test and post-test questionnaires

Test items	IMPROVE Pre-test		IMPROVE Post-test		t
	M	SD	M	SD	
comprehension	3.108	0.567	3.215	0.517	-2.925**
connection	3.010	0.622	3.178	0.605	-5.004***
strategic	3.487	0.611	3.632	0.574	-3.324***
reflection	3.397	0.501	3.506	0.528	-4.278***

* : $p < .05$ ** : $p < .01$ *** : $p < .001$

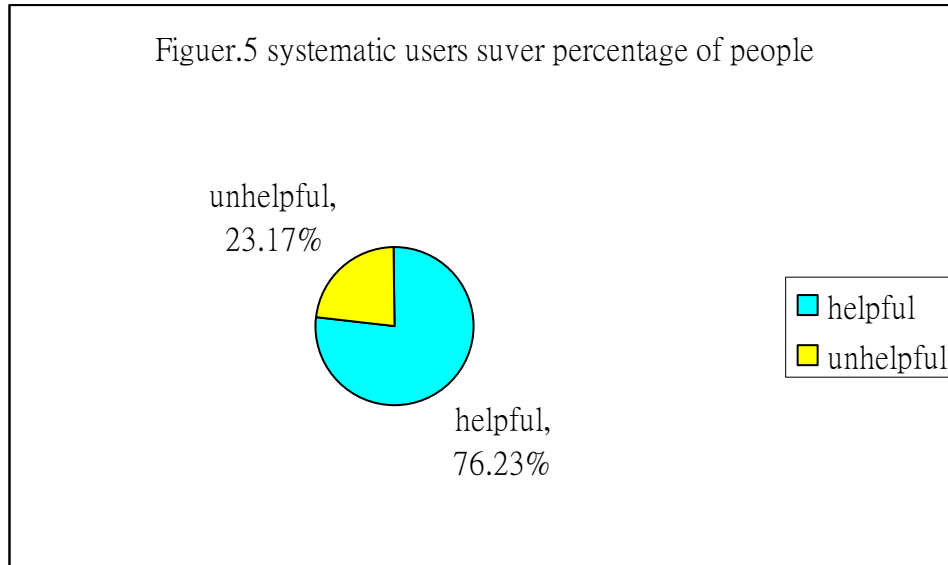
Finally, we focus on interconnection and the survey of systematic users to do the analysis. According to the first interconnection result, the highly-aware people's choices are often highly-aware people, too, while the low-aware people do not incline to any group of people as their choices, and the medium-aware people's choices are mostly of higher or medium awareness (Table.8). Furthermore, the two choices of highly-aware and medium-aware group are usually the same, while the low-aware group do not necessarily choose the same people(Table.9). As for the analysis on systematic users survey, 76.23 of people think it helpful to fill the concept deficiency and integrate these concepts through concept map systematic modeling and interconnection , and 23.17% unhelpful (Figure.5).

Table8: statistics of people's number on the first choice of interconnection on level of awareness

level of awareness	the first choice		
	highly-aware	low-aware	medium-aware
highly-aware	15	4	6
low-aware	3	9	4
medium-aware	10	9	12

Table9: statistics of people's number on the second choice on level of awareness

level of awareness	the second choice	
	the same as the first choice	different from the first choice
highly-aware	21	4
low-aware	5	11
medium-aware	23	8

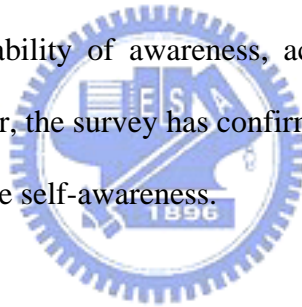


5 Conclusion

According to the experiment results of this research, it is proved that, through the process of concept map modeling and interconnection, the level of self-awareness can be elevated by way of the feedback from peer-assessment. The better quality the feedback, the more it boosts the level of self-awareness; conversely, the poorer quality the feedback, the harder it elevates self-awareness. Furthermore, the more caring about the peer-feedback, the more it elevates one's level of self-awareness; the less caring, the worse the effect. For those who have a high level of self-awareness, most of them care more about peer critiques, give back high-quality judgments, and are more aware of the peer feedback they receive. This may result from their exquisite minds, shrewd modeling and a keener ability of self-awareness. On the contrary, those who have a lower level of self-awareness may be innately tardy in awareness, which results in giving much poorer quality of peer judgment, receiving peer feedback of the same low quality, and paying not much attention to them.

During the interconnection in this research, we've found that the highly-aware and medium-aware often choose the students with higher level of self-awareness, like themselves,

to interconnect. And their second choices are often the same as the first choices. On the other hand, the low-aware do not necessarily make choices based on a certain level of self-awareness, but their choices are quite average, ranging from the high to the low; Their second choices do not certainly happen to be the same with the first choices, either. It may be because the low-aware cannot clearly distinguish the quality of a work. Therefore they aren't able to compare the quality of the first choice's work and the second choice's work. That's why they are not bound to choose works that reach a certain level of quality. All in all, through the survey of this research, most students find it helpful to make up the gaps and defects in their original concepts by model and interconnecting with peers' concept maps. So in this research, the adopted method of concept maps modeling and interconnection has produced the desired effect of cooperative learning. Under this effect, the peer feedback furthermore assists students' ability of awareness, acting as a big help to integrating the curriculum concepts. Altogether, the survey has confirmed that the concept map modeling and interconnection do help promote self-awareness.



REFERENCE

- Bandura, A. (1978), The self-system in reciprocal determinism. *American Psychologist*. 33, 122~147.
- Bandura. A. (1986), *Social foundations of thought and action: A social cognitive approach*. Englewood Cliffs. NJ: Prentice-Hall.
- B.Kramarski & R.Ritkof (2002)The effects of metacognition and email interactions on learning graphing. *Journal of Computer Assisted Learning* 18, 33-43
- B.Kramarski(1997) IMPROVE:A Multidimensional Method for Teaching Mathematics in Heterogeneous Classrooms.*American Education Research Journal Summer1997 Vol34 NO.2P365~394*
- Brian P.O' Connor and Jamie Dyce(1993), Appraisals of musical ability in bar bands:Identifying the weak link in the looking-glass self chain. *Basic and applied social psychology*,14(1),69-86.
- Cohen, J. B. (1985) . “A reexamination of feedback in computer-based instruction: Implication for instructional design”. *Educational Technology*
- Cooley,C. H.(1902),Human nature and social order. *New York: Scribner' s*.
- Dempsey, J. V. & Scales, G. C. (1993) . “Interactive instruction and feedback”. *Educational Technology Publications, New Jersey*.
- Duval, S. & Wicklund, R. A.(1972). A theory of objective self-awareness. *New York:Academic Press*.
- Elliot Aronson, Timothy D. Wilson, Robin M. Akert(1995), *Social psychology* P241.
- Flavell, J.H. (1976), Metacognitive aspects of problem solving. *In L. Resnick (Ed.), The nature of intelligence. Hillsdale, NJ:Erlaum*.
- Henderson,K.(1991).Flexible sketches and inflexible data bases: Visual communication,conscription devices, and boundary objects in design engineering. *Science*,

Technology, & Human Values, 16(4), 448-473.

Lin, Sun, Kao (2002). Designing a networked-sharing construction environment. *British Journal of Educational Technology* Vol.33 NO.4 2002

Mead, George H. (1934), *Mind, Self, and Society: From the Standpoint of a Social Behaviorist*, edited by Charles W. Morris. University of Chicago Press.

Millar, M. G., & Tesser, A. (1986), Effects of affective and cognitive focus on the attitude-behavior relationship. *Journal of Personality and Social Psychology*, 51, 270-276.

Nadler, D. A., (1977). *Feedback and Organization Development: Using Data-Based Methods*. Reading, Mass: Addison-Wesley.

Novak, J. D. & Gowin, D. B. (1984). *Learning How to Learn*. Cambridge, MA: Cambridge University Press.

Park, O., & Gittelman, S. (1992) . "Selective use of animation and feedback in computer-based instruction". *Educational Technology Research & Development*, 42 (4) , 27-38.



Roth W. M. & Roychoudhury, A. (1992). The social construction of scientific concepts or the concept map as conscription device and tool for social thinking in high school science. *Science Education*, 76, 531-557.

Schmidt, R. A., (1982). *Motor control and learning*. Homewood, IL : Human Kinetics.

Sluijsmans, D., Dochy, F., and Moerkerke, G. (1999), Creating a learning environment by using self-, peer- and co-assessment. *Learning Environment Research*, 1, 293-319. 24.

Steiner, I. D. (1972). *Group process and productivity*. New York: Academic Press.

Thornton, D. A., & Arrowood, A. J. (1966). Self-evaluation, self-enhancement, and the locus of social comparison. *Journal of Experimental Social Psychology, Supp.* 1, 4048.

Sun C T and Chou C (1996) Experiencing CORAL: design and implementation of distant cooperative learning. *IEEE Transaction on Education* 39 357–366.

Wheeler, Stanton, David Weisburd, & Nancy Bode (1982) "Sentencing the White-Collar

Offender: Rhetoric and Reality," 47 *American Sociological Rev.* 641-59.

Zanna, Mark P., George R. Goethals, and Janice F. Hill(1975) "Evaluating a sex-related ability: Social comparison with similar others and standard setters." *Journal of Experimental Social Psychology*, 11: 86-93.

Zimmerman, B. J. & Martinez-Pons M.(1986), Development of a structured interview for assessing student use of self-regulated learning strategies. *American Educational Research Journal*, 23(4), 611-628.

林珊如、卓宜青、劉旨峰、袁賢銘(2000)。網路化學習歷程與同儕互評系統之建構經驗。
資訊與教育雜誌，80期，57-64頁。

高宜敏(2001)。合作競爭式的網路分享建構學習環境。國立交通大學資訊科學研究所碩士論文。



Appendix

AppendixA Background

Self-awareness

Aronson (1995) suggests that self-recognition be done by the following methods:

(1) By introspection

Namely, looking into the innermost and inspecting inner messages concerning the thoughts, feelings and motives. And by way of these inner messages, hopefully, we can recognize ourselves. Internal clues reveal what we are much more than external behaviors do, for our thoughts and feelings are seldom influenced by outer pressure. (Ross & Anderson , 1984)

(2) By model our own behaviors

Bem(1972) pointed out, according to self-perception theory, that when the internal clues appear to be vague, unclear or unaccountable, we tend to conclude ourselves in terms of external behaviors; that is to say, people often rely on external clues to infer personal internal state.

(3) By self-schemas

Self-schemas means compiling an intellectual structure from our cognitive information based on past experience, thus helps us recognize, explain and anticipate our own behaviors. (Markus,1977;Markus & Sentis, 1982; Markus &Zajonc, 1985) In other words, we can utilize introspection and observe our behaviors to know ourselves, furthermore organize this information and store them in self-schemas.

(4) By social interaction

Social interaction plays an essential role in self-development concept, for sometimes we gather information concerning ourselves through others' critiques or reactions to us.

Sociologist Cooley, by way of “the Looking-Glass Self”, pointed out that our definitions of ourselves construct according to others’ reactions and judgments. Mead (1934) also indicated that the ability to accept others’ points of view is one vital step to forming one’s ego. Once we constantly accept what others think of us, then the Looking-Glass Self shapes.

IMPROVE

Aiming at the meta-cognition enlightenment, Mevarech & Kramarski (1997) have developed the IMPROVE model, which has been experimented and verified through mathematical curriculum. By raising questions drawn from the formula and diagrams, students explain the meanings of every sign, figure or diagram, whether there are any changes or if they’ve found any mistakes. Then they conclude on the basis of the clues offered by mathematical formula and diagrams. By the above-mentioned steps, students can reflect whether or not they have a complete understanding of the course, and if the course does any help to them. The question-raising of IMPROVE model is a succession of the learning or teaching process: Introducing New concepts ∙ Meta-cognitive questioning ∙ Practicing ∙ Reviewing ∙ Obtaining mastery ∙ Verification and Enrichment. This process encompasses four aspects: comprehension, connection, strategic and reflection, which are the necessary steps in meta-cognition. This idea coincides with Brown’s (1987) viewpoint. He considers meta-cognition the knowledge of personal thinking and learning actions and knowing how to adjust or control. In other words, a person not only realizes his own cognitive condition, but also knows how to manage himself.

Concept maps

From Novak & Gowin’s perspective of concept maps construction, it will depend on the six criteria, suggested by Novak & Gowin (1984), to decide whether or not a concept map is a good one that conforms to the gist: Is the concept representative? Is it clearly sorted? Does it

follow the rule “the former abstract, the latter concrete”? Is every concept clearly and meaningfully connected? Are there any creative overlapping junctures? Are there any vivid examples?

AppendixB Method

IMPROVE 信效度分析

IMPROVE 量表經過信效度的分析，整體上看來的信效度表現都不錯，均都有達到一定的水準，且因素分析上也都有達到一致性。

(1) 項目分析

Table(1) IMPROVE 量表之項目分析結果總表

Question	M	SD	Skewness	Exteremes-t	correlation	Factor loading
1.你曾經想過需要建構概念圖的概念詞有哪些?	3.72	.94	-.186	-6.166	.4121	.426
2.你曾經想過要解釋自己畫的概念圖?	3.68	.98	-.381	-4.712	.3558	.379
3.你曾經想過什麼時候要用哪種元件?	2.62	1.15	.261	-5.873	.4115	.458
4.你曾經想過什麼時候要用哪種補間動畫?	3.07	1.01	.060	-4.243	.3739	.425
5.你曾經想過繪圖工具的特性?	3.59	1.02	-.139	-5.326	.4244	.501
6.你曾經想過場景切換的特性?	3.02	1.08	-.007	-5.767	.3921	.424
7.你有曾經想過遮罩可用來做什麼功	3.05	1.15	.014	-1.814	.1244	.172

能?						
8.你有曾經想過ActionScript可用來做什麼功能?	3.64	1.11	-.548	-3.226	.2250	.250
9.你曾經想過圖層和影格的差別?	2.83	.82	-.257	-5.713	.4682	.517
10.你曾經想過一般影格和關鍵影格的差別?	2.80	1.14	.030	-6.046	.4477	.454
11.你曾經想過形狀補間和移動補間的差別?	3.12	1.22	.105	-2.580	.2219	.242
12.你曾經想過圖像元件和影片片段的差別?	2.41	1.26	.595	-2.196	.1792	.187
13.你曾經想過元件和圖庫的關連性?	3.10	1.06	.105	-4.739	.3178	.347
14.你曾經想過 ActionScript 和程式語法的關連性?	3.32	1.03	-.190	-4.474	.3103	.334
15.你曾經想過補間動畫和逐格動畫的關連性?	2.97	1.17	.077	-4.135	.3136	.338
16.你曾經想過遮罩和圖層間的關連性?	3.18	1.23	-.099	-7.284	.4495	.460
17.你曾經想過將圖像變成元件的步驟?	3.12	1.01	.033	-4.285	.3636	.382
18.你曾經想過製作影片片段步驟?	3.47	1.30	-.407	-5.813	.4010	.464
19.你曾經想過製作時間軸特效的步驟?	3.16	1.10	-.169	-5.395	.4021	.467
20.你曾經想過製作轉場效果的方法?	3.39	1.17	-.150	-5.729	.4227	.442
21.你曾經想過編輯 ActionScript 的方法?	3.60	1.12	-.378	-5.430	.4327	.492

22.你曾經想過製作 Flash 動畫可用哪些元件?	2.95	1.13	.189	-5.553	.3731	.407
23.你曾經想過製作 Flash 動畫需要注意哪些地方?	3.15	1.12	.098	-5.870	.4279	.477
24.你曾經想過製作 Flash 動畫的原理有哪些?	3.62	1.12	-.258	-3.415	.3197	.330
25.你曾經想過自己對課程的概念是否了解清楚?	2.95	1.20	.183	-7.470	.4221	.500
26.你曾經想過別人對課程的概念是否了解清楚?	3.68	.98	-.400	-4.573	.2973	.357
27.你曾經想過你的概念圖是否內容豐富、架構清楚?	4.09	.70	-.362	-6.260	.4795	.553
28.你曾經想過別人的概念圖是否內容豐富、架構清楚?	3.42	1.06	-.028	-7.084	.5415	.617
29.你曾經想過你會因為看過他人的概念圖而反省自己的概念圖以求改進?	4.09	.80	-.875	-5.153	.4743	.557
30.你曾經想過自己建構的概念圖內容是否符合單元題目?	4.07	1.01	-.810	-6.650	.4474	.525
31.你曾經想過建構概念圖對是否對課程學習有幫助?	3.34	.92	.089	-5.506	.4596	.523
32.你曾經想過是否可以將概念圖應用到其他的課程?	3.16	1.09	-.005	-7.165	.4580	.523

Corrected Item-Total Correlation，亦為信度。

因素負荷(Factor loading)：採用主成份分析單一因素的原始因素負荷值

(2) 「Cronbach's α coefficient」

Table2. IMPROVE 量表題目之內部一致性信度

	IMPROVE pre-test
Cronbach's α	.8736

(3) 因素分析

Table3. IMPROVE 量表之因素分析摘要表

name number	comprehension	reflection	connection	strategic
8	.723			
6	.716			
5	.681			
1	.670			
4	.618			
3	.568			
7	.579			
2	.433			
26		.783		
27		.716		
25		.695		
28		.656		
29		.653		
32		.637		
30		.595		
31		.524		

10			.734	
13			.685	
9			.680	
11			.604	
15			.559	
16			.553	
12			.499	
14			.380	
17				.716
20				.695
21				.640
18				.637
22				.583
24				.496
19				.474
23				.460
可解釋變異量%	19.831	9.840	7.399	6.281
α 值	.7532	.7302	.7406	.7406

概念圖和給同儕評語評分

我們首先請針對「Novak 和 Gowin 的概念圖建構」決定學生建構概念圖的好壞，另外在依照給同儕評語的品質將之居別好壞，我們依照這兩各項目給分，配分方式如表(4)的 2x2 配分表，目的是為了避免學生亂畫概念圖和隨便給評語，讓學生能夠認真的進行利用概念圖觀摩和互連的實驗。依照配分分的分析(表 5)，本研究發現 72 個學生中，多數為概念圖畫的好給同儕評語品質也好，因此在本研究中我們可以說概念圖作品畫的好

的學生多數給同儕的評語也是好的。而概念圖畫的差的同學多數也會給好的評語，應該是同學覺得如果自己的概念圖畫的不好，但是還可以因為給別人好的評語得到不錯的分數，不會因為畫的差就得到低分。

Table4：概念圖×給同儕評語配分表

概念圖	給同儕評語品質	
	好	差
好	5	3
差	3	1

單位:人

Table5：概念圖×給同儕評語人數統計

概念圖	給同儕評語品質	
	好	差
好	32	11
差	21	8

單位:人

同儕回饋評量

Table6：同儕回櫃評量

1.我有確實觀摩全部不同單元同學的概念圖。
2.我有認真仔細觀摩同學的概念圖。
3.我有依據「Novak 和 Gowin 概念圖建構要點」的程度來挑選互連對象。
4.我選擇的互連對象是因為對方的概念圖能夠和自己結合。
5.我選擇的互連對象是因為對方的概念圖畫的好。
6.我選擇的對象有認真的給我評語，自己也有認真給他人評語。
7.我覺得觀摩別人的概念圖，可以幫助自己反省自己畫的概念圖。
8.我覺得同儕給的評語有助於下一次把概念圖畫的更好。
9.我覺得被連結和被拒絕次數會幫助自己發現自己畫的概念圖好壞。
10.我覺得透過概念互連對課程概念整合和啟發有幫助。
11.我覺得經由「觀摩和互連」可以對不同單元的概念作連貫，是一種有意義的學習方法。
12.我覺得經由「觀摩和互連」可以讓我培養辨別概念圖好壞的能力。
13.我覺得經由「觀摩和互連」可以促使自己思考所謂好的概念圖需具備哪些特性。
14.我覺得經由「觀摩和互連」可以讓我發現是否需要改變自己的學習方式。
15.我會因為被連接的次數，而修改概念圖。
16.我會因為被拒絕的次數，而修改概念圖。
17.我會因為觀摩別人的概念圖，而修改概念圖。
18.我會針對同儕給我的評語，而修改概念圖。
19.我會希望大家給我好的評語而努力畫概念圖。
20.我會希望他人多和我連結而努力畫概念圖。

互連和系統使用調查

Table7.互連和系統使用調查

內容	是	不是
1.你第 2 次互連的對象和第 1 次選擇是同一個人。	<input type="checkbox"/>	<input type="checkbox"/>
2.你無法決定哪個同學畫的比較好。	<input type="checkbox"/>	<input type="checkbox"/>
3.你滿意你選擇的互連對象所畫的概念圖	<input type="checkbox"/>	<input type="checkbox"/>
4.你覺得自己畫的不錯，可是同學不選你。	<input type="checkbox"/>	<input type="checkbox"/>
5.你覺得透過這個系統的功能是有助於補足原先概念上的缺失和整合概念。	<input type="checkbox"/>	<input type="checkbox"/>
6.這個系統可以把你想建立的概念和連結線，以視覺化的方式呈現出來，是有助於你對整個概念圖繪製的掌控。	<input type="checkbox"/>	<input type="checkbox"/>
7.你覺得使用這個系統繪製或修改概念圖比使用紙筆方便很多。	<input type="checkbox"/>	<input type="checkbox"/>
8.你覺得這個系統操作介面清楚，在使用上很有幫助。	<input type="checkbox"/>	<input type="checkbox"/>

Appendix C Systematic

概念圖系統教學網頁

除了課堂授課外，學生可透過教學網頁(<http://140.113.88.73/conceptmap/index.html>)，自行下載系統以及了解課程進度和課程內容。

概念圖教學 - Microsoft Internet Explorer

檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)

網址(O) <http://140.113.88.73/conceptmap/index.html>

概念圖教學觀摩與互連

消息公佈 聯絡我們

活動目的

〔活動目的〕：幫助您學習如何主動建構起自己的知識，並藉由同學間的觀摩和互連（綜觀）達到互助學習的目的。

超人：唉～每天忙著解救人類就好累了，還要花好多的時間唸書，而且每本書的內容都這麼多，都唸不完，好怕書好，考試也考不好，這樣我一定會被其他超人笑。

女超人：對阿!!人家是過目不忘，我是看過都忘，那個內容的重點是什麼?和以前學的有沒有關係呢?總之就是「霧煞煞」，看到書就想睡覺。如果有一種方法可以幫助我做重點概念的整理，讓我想忘都忘不了，那有多好啊!!

小超人：別擔心啦!馬上教你們一個有效學習知識的方法。學完保證可以打通你的任督二脈，把所有的概念通通結起來!以後遇到類似的問題，輕輕鬆鬆就可以舉一反三。就算你不能學好絕世武功，至少也知道自己的罩門(概念的)在哪裡。

系統教學 (互連)

Figure1:課程教學網頁



Figure2:概念圖課堂教學



Figure3:概念圖課堂教學

系統介面

Figure4:概念圖使用系統介面

REFERENCE

Bem, D. J. (1972). Self-perception theory. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 6, pp. 1-62). New York: Academic Press.

B. Kramarski (1997) IMPROVE: A Multidimensional Method for Teaching Mathematics in Heterogeneous Classrooms. *American Education Research Journal Summer 1997* Vol 34 NO. 2 P 365~394

Brown, A. L. (1987). Metacognition, executive control, self-regulation, and other more mysterious mechanisms. In F. E. Weiernt & R. H. Kluwe (Eds.) *Metacognition, motivation, and understanding*. Hillsdale, NJ: Lawrence Erlbaum.

Cooley, C. H. (1902). *Human nature and social order*. New York: Scribner's.

Elliot Aronson, Timothy D. Wilson, Robin M. Akert (1995), *Social psychology* P241.

Markus, H. (1977). Self-information and processing information about the self. *Journal of Personality and Social Psychology*, 35, 63-78.

Markus, H. & Sents, K. (1982). The self in social information processing. In J. Suls (Ed.), *Psychological Perspectives on the Self* (Vol. 1, pp. 41-70). Hillsdale, NJ: L. Erlbaum.

Markus, H. and R. Zajonc. 1985. "The cognitive perspective in social psychology". Pp. 137-230 in G. Linzey and E. Aronson (eds.). *Handbook of Social Psychology* Vol 1, 3rd edition. NY: Random House.

Mead, George H. (1934), *Mind, Self, and Society: From the Standpoint of a Social Behaviorist*, edited by Charles W. Morris. University of Chicago Press.

Novak, J. D. & Gowin, D. B. (1984). *Learning How to Learn*. Cambridge, MA: Cambridge University Press.