

Professional Development Programme on the
“New Senior Secondary Learning & Teaching Strategies for Information and
Communication Technology (ICT) –
(3) Development of Generic Skills (Critical Thinking, Creativity and Problem Solving)
(Course ID: CDI020061598)
Assignment Summary Report

1. Background

The EMB commissioned the Department of Mathematics, Science, Social Sciences and Technology of The Hong Kong Institute of Education to conduct the captioned course on 12.2.2007 and 13.2.2007, with the aim to introduce learning & teaching strategies on the development of generic skills (critical thinking, creativity and problem solving skills) to ICT teachers. A total of 336 teachers attended the course. Among them, 332 have completed and returned the assignment with a response rate over 98.8%.

2. Analysis and Findings of the Assignments

During the course, each participant was required to submit an assignment which included three exercises as a part of the programme requirement (Appendix 1 refers).

2.1 Exercise 1 (Problem-Solving)

There were two scenarios to be solved. Participants were given 3 cards for each scenario to create sentences.

The first scenario consisted of the following words: **Binary**, **Hyperlink** and **Interaction**. For the first scenario, there were basically five different ways to create sentences. Many participants created concise sentences like Sample 1 and Sample 2 which reflected participants' understanding of the merit of **hyperlink**. A number of participants created sentences which make use **interaction** to teach the **binary** concept (Sample 3). Some participants used the given words to illustrate **binary** concept is the backbone of the computer operations (Sample 4). Lastly, several participants created the sentences to include all the three given words in our ICT curriculum (Sample 5).

Table 1: Making sentences from the given words: Binary, Hyperlink and Interaction

Sample	Sentence
1.	超連結為網頁帶來互動，讓學生更易明白二進制。

2.	二進制數據是學生最感困難的課題，超連結的互動網頁卻是他們最感興趣的。
3.	超連結是一種能提升互動性的方法，利用二進制轉換至十進制是其中一個可以應用此法的例子。
4.	任何一個網頁或電腦檔案背後也只是一堆二進制數字，但卻可以演變成文字、圖像、超連結及各式各樣的互動元素。
5.	ICT 課程內容豐富，包括二進制計算、互動多媒體及運用超連結建立網站。

The second scenario consisted of the following words: **Spreadsheet, Search and Chart**.

Similarly, there were basically five different ways to create sentences from the second scenario. All participants attempted this exercise and most of them had created two sentences for each scenario. Many participants created concise sentences like Sample 6 and Sample 7 which reflected the functionalities of a spreadsheet. Some participants suggested using the Internet to **search** for information and then to use a **spreadsheet** to calculate, manipulate and present the information using **charts** (Sample 8 and Sample 9). Lastly, several participants created the sentences to seek “Help” from the software if they were not too sure of its functionalities (Sample 10).

Table 2: Making sentences from the given words: Spreadsheet, Search and Chart

Sample	Sentence
6.	試算表可以用來搜尋、分析、篩選數據及制作圖表。
7.	試算表的圖表並不能讓你輕易地搜尋數據。
8.	在搜尋資料後，可利用試算表制作圖表的功能，把資料整理及顯示。
9.	我們可在網上搜尋資料，然後把資料輸入試算表中，最後利用相關資料建立圖表。
10.	如果你不懂得使用試算表軟件中繪畫圖表，你可以使用 Office 小幫手搜尋有關項目。

Findings and Reflection

The samples from Table 1 & 2 revealed that problem solving skill depends on mastery of basic knowledge pertaining to the problem area. Also, motivation is required for participants to want to solve the problem. Problem solving involves using thinking skills to resolve a difficulty.

Teachers are encouraged to help students acquire the knowledge they need to solve problems, and consider prepare students to approach problem solving in a structured way.

2.2 Exercise 2 (Creativity)

Participants were asked to enhance the given figure to stimulate their creativities. There were a variety of pictures drawn stemmed from the given figure. Many participants took the figure as a vase and decorated it with beautiful details. Perhaps it was approaching the Lunar New Year; quite a number of pictures had the theme of celebrating the New Year (Figure 1). Some teachers used the figure as a nose and draw a face accordingly (Figure 2) whilst some used the figure as the central part of a creature and drew some beautiful cartoons like Figure 3. Several participants used the figure to form a train (Figure 4) whilst several used the figure to create some interesting pictures which were very unique and meaningful (Figure 5).

Figure 1: Use the given picture as a vase and decorate it accordingly.

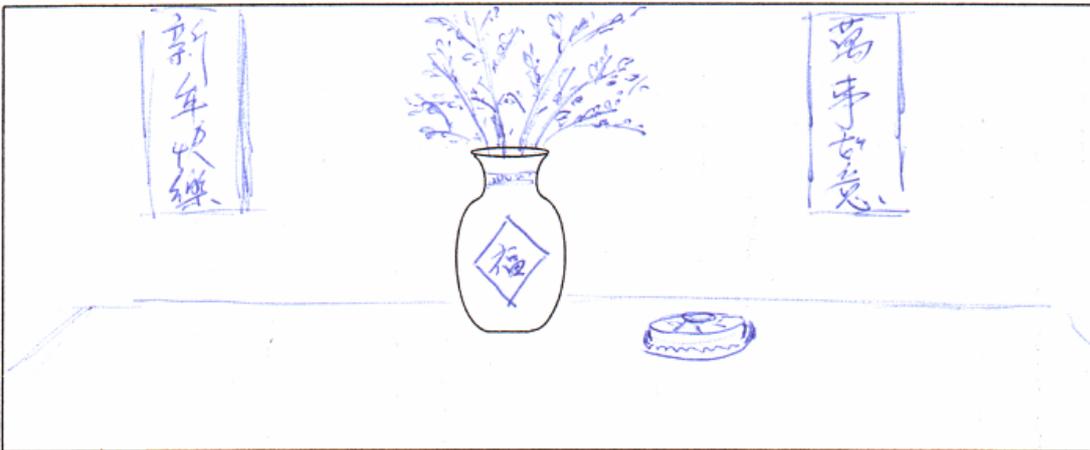


Figure 2: Use the given picture as a nose and enrich it with a face



Figure 3: Use the given picture as the central body of a creature

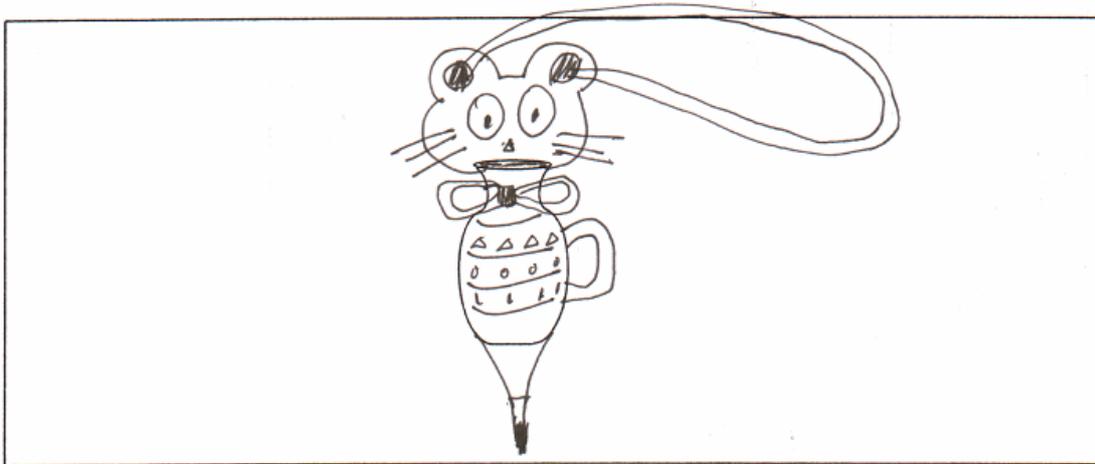


Figure 4: Use the given picture as part of a train.

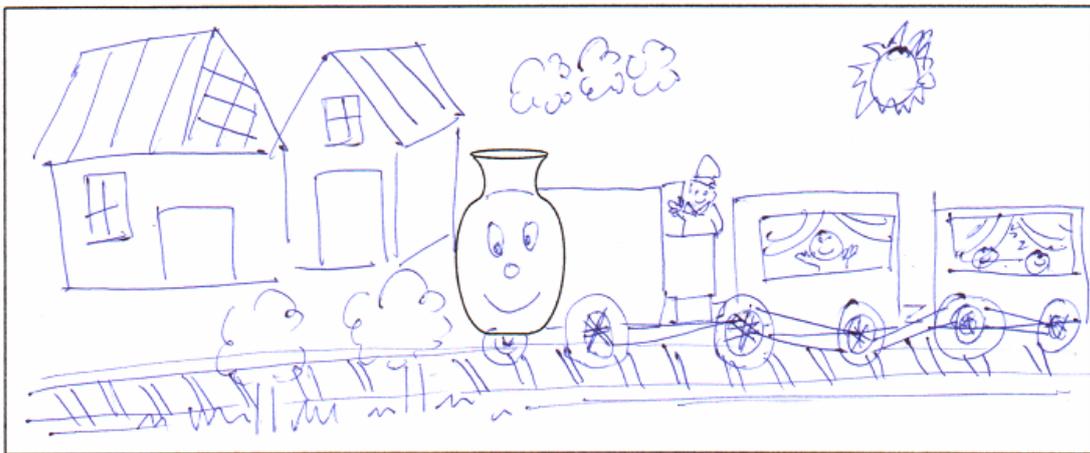
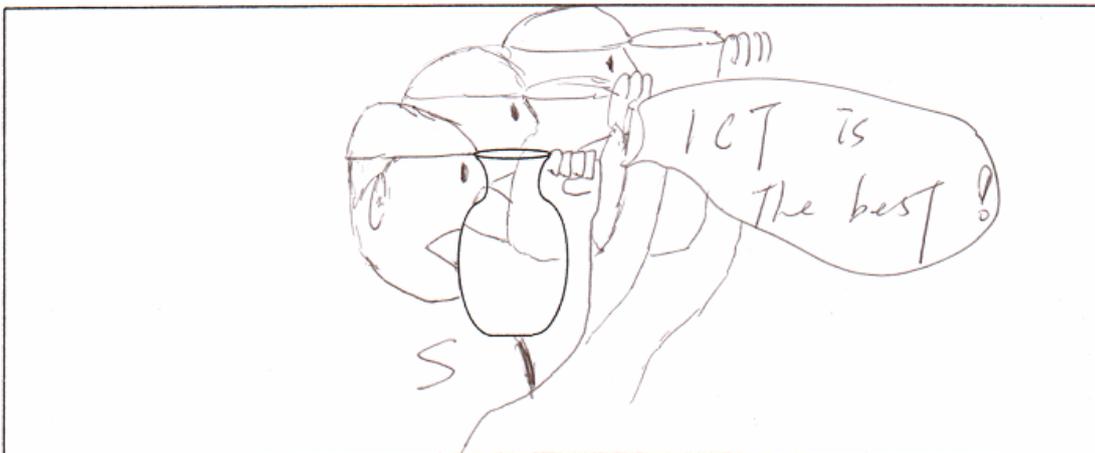


Figure 5: Use the given picture as the central part of a theme.



Findings and Reflection

As depicted from the sample figures above, creativity arises through the following:

- *Creativity rests on the ability of participants to combine previous disparate elements in a new way.*
- *Participants will be most creative when they feel motivated.*

To be creative, we must be ready to explore connections between different areas. To promote innovation and creativity among students, teachers should encourage students investigating different ways of looking at problems, tasks and activities. Help students to develop interests and passion in classroom environments, link problems, tasks and activities to students' real lives. Where appropriate, allow students to define their own problems and conduct a self-assessment of their efforts and outcomes.

2.3 Exercise 3 (Critical Thinking)

Participants were asked to consider the situation in their school and draw a “Strength Weakness Opportunity and Threat” (SWOT) diagram to examine the issue: “**Infusing the teaching of thinking into ICT contents**”. The aim of the exercise was to enhance their critical thinking skills. They have come up with 1 to 2 points to 4 to 5 points. The points made were related to students, teachers, schools environment, curriculum and resources etc. Some points appeared to be contradictory as it depended on the perspectives of different teachers and their school environments. Authentic examples could be found from Table 3 to Table 7 in Appendix 2.

SWOT analysis on “**Infusing the teaching of thinking into ICT contents**” by participants are summarised below.

Strength:

- Students have good standard
- Students can be molded
- Students are creative
- Some teachers have studied some courses which enable them to infuse teaching into the curriculum
- EMB provides different professional development courses and there is no need to spend time to seek related materials
- Supportive parents

Weakness:

- Students are passive
- Some students are not very good in English

- Students are not homogenous so it could be difficult to teach them to think
- Some students do not have the confidence to share their thoughts
- Some students do not have the basic knowledge to think critically
- Some teachers have not been trained to use this teaching method to teach
- Teachers do not have the experience of this teaching approach
- The present curriculum is inflexible
- Insufficient teaching hours
- Insufficient resources to support this teaching method
- There is not much materials for teaching the slower learners
- Schools are not very supportive in technology education

Opportunities:

- Provide opportunities to infuse thinking into their daily lives
- The alternate teaching methods might arouse students' interests
- More students may take this subject as more students are interested in this teaching approach
- The NSS creates opportunities for schools to rethink each subject area and to align with the requirements of EMB
- The NSS enables students to take ICT up to Secondary Six so that they would have more time to be trained
- The NSS is more flexible so that it is possible to introduce such a concept

Threats:

- Students are of diverse learning abilities and might not be able to grasp this learning approach in ICT discipline
- Weaker students might not be able to learn using this approach as this teaching method is new to them
- Difficult to manage the class when they can express themselves "freely"
- Some teachers might leave the school if their "teaching methods" are proved to be good
- Inexperienced teachers may spend too much time on teaching thinking skills which leads to insufficient time to teach the required curriculum
- The requirements of public examinations might not be in line with this teaching approach which increases students' workload
- Difficult to assess thinking skills which may lead to unfairness

Findings and Reflection

*The points summarised above revealed that the effectiveness/success of “**Infusing the teaching of thinking into ICT contents**” depends on many factors, such as student population, instructional approach selected by teachers and administrative support from schools, etc.*

To foster the development of thinking skills, students need to feel free to explore and express opinions, to examine alternative positions on problems/tasks/activities, and to justify beliefs about what is true and good, while participating in an orderly classroom discourse. Instructional approaches found to promote thinking skill development include redirection, probing, reinforcement and lengthening wait-time during classroom questioning.

Teaching Strategies to Help Promote Critical Thinking

- **CATS (Classroom Assessment Techniques):** [Angelo](#) stresses the use of ongoing classroom assessment as a way to monitor and facilitate students' critical thinking. An example of a CAT is to ask students to write a "Minute Paper" responding to questions such as "What was the most important thing you learned in today's class? What question related to this session remains uppermost in your mind?" The teacher selects some of the papers and prepares responses for the next class meeting.
- **Case Study /Discussion Method:** [McDade \(1995\)](#) describes this method as the teacher presenting a case (or story) to the class without a conclusion. Using **prepared** questions, the teacher then leads students through a discussion, allowing students to construct a conclusion for the case.
- **Using Questions:** [King \(1995\)](#) identifies the way of using questions in the classroom - *Reciprocal Peer Questioning*: Following lecture, the teacher displays a list of question stems (such as, "What are the strengths and weaknesses of..."). Students must write questions about the lecture material. In small groups, the students ask each other the questions. Then, the whole class discusses some of the questions from each small group.
- **Conference Style Learning:** The teacher does not "teach" the class in the sense of lecturing. The teacher is a facilitator of a conference. Students must thoroughly read all required material before class. Assigned readings should be in the zone of proximal development. That is, readings should be able to be understood by students, but also challenging. The class consists of the students asking questions of each other and discussing these questions. The teacher does not remain passive, but

rather, helps "direct and mold discussions by posing strategic questions and helping students build on each others' ideas" ([Underwood & Wald, 1995, p. 18](#)).

3. Conclusion

Problem solving is applied thinking.

Critical thinking is about correct thinking, making reasoned judgments.

In both school settings and in the world outside of school, it is crucial for people to have "skills in questioning, analyzing, comparing, contrasting, and evaluating so that [they] will not become addicted to being told what to think and do" (Freseman 1990, p. 26)

Creativity is about alternative possibilities. The aim of creative thinking is to stimulate curiosity and promote divergence.

All in all, we believe that teachers' warmth and encouragement enhance all kinds of learning.

References

- Angelo, T. A. (1995). Beginning the dialogue: Thoughts on promoting critical thinking: Classroom assessment for critical thinking. *Teaching of Psychology, 22(1)*, 6-7.
- McDade, S. A. (1995). Case study pedagogy to advance critical thinking. *Teaching Psychology, 22(1)*, 9-10.
- King, A. (1995). Designing the instructional process to enhance critical thinking across the curriculum: Inquiring minds really do want to know: Using questioning to teach critical thinking. *Teaching of Psychology, 22 (1)* , 13-17.
- Underwood, M. K., & Wald, R. L. (1995). Conference-style learning: A method for fostering critical thinking with heart. *Teaching Psychology, 22(1)*, 17-21.
- Freseman, R.D. (1990). Improving Higher Order Thinking In Middle School Geography Students by Teaching Skills Directly. Fort Lauderdale, FL: Nova University, (ED 320 842) p.26

Appendix 1

Professional Development Programme on ‘New Senior Secondary Learning & Teaching Strategies for Information and Communication Technology – (3) Development of Generic Skills (Critical thinking, creativity and problem solving skills)’

Name: _____ (Please print) Name in Chinese: _____

School Name: _____

E-service Account: _____ (Please print clearly)

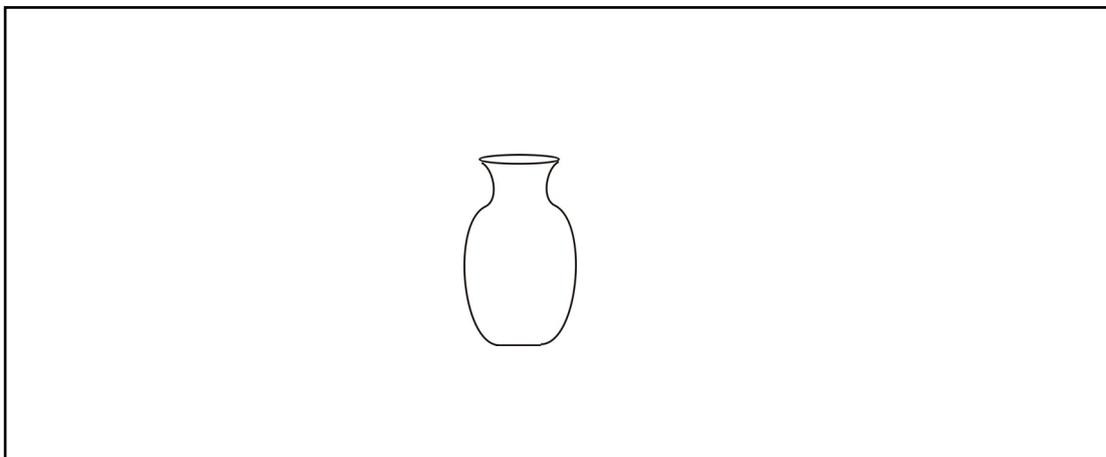
Instructions:

There are THREE questions in these TWO pages. Participants are requested to answer ALL questions and to submit it at the end of the course.

Exercise 1 — Activity 2.1 : Please create 1 to 2 sentences from the given cards below:

Card 1	Card 2	Card 3	Sentence
Binary	Hyperlink	Interaction	1. 2.
Spreadsheet	Search	Chart	1. 2.

Exercise 2 — Activity 2.2 : Draw anything you like to improve the picture below.



Exercise 3 — Activity 4.4 : Consider the situation in your school and draw a SWOT diagram to examine the following issue:

Infusing the teaching of thinking into ICT contents.

Strength (S)	Weakness (W)
Opportunities (O)	Threat (T)

Appendix 2

Table 3: Sample 11 on SWOT analysis

強項 (S)	弱項 (W)
<ul style="list-style-type: none"> ● 學生能力高，可塑性高 	<ul style="list-style-type: none"> ● 學生要以英語表達思考 ● 本地化的報章及雜誌多以中文為主，須要翻譯為英文作上課用。 ● 學生未夠背景作討論及融入。 ● 部分教師未有足夠專業發展應付新高中課程我思維培訓。
機會 (O)	危機 (T)
<ul style="list-style-type: none"> ● 新高中選修同學不受 A Maths 規限，而不選 ICT。 ● 電腦科開辦至高中而並非到中五為止。 ● 增加同學間的互動學習機會。 	<ul style="list-style-type: none"> ● 選擇選修單元不能滿足個別同學的理想單元。 ● 課程主要參考(教統局)以中文為主，欠缺本地化的英文參考文章及資料。 ● 縮班問題 ● 學習能力差異，學生的掌握是否對 ICT 的應用是否了解。

Table 4: Sample 12 on SWOT analysis

強項 (S)	弱項 (W)
<ul style="list-style-type: none"> ● 學生背景清純 ● 成績及學習動機好 ● 校友支持，外來力量多 ● 學習氣氛優良 	<ul style="list-style-type: none"> ● 校舍殘 ● 器材少 ● 課程欠彈性 ● 財務安排欠長遠 ● 老師認同
機會 (O)	危機 (T)
<ul style="list-style-type: none"> ● 年長老師退下來 ● 新老師用新教學法 	<ul style="list-style-type: none"> ● 校網競爭大 ● 無經驗

Table 5: Sample 13 on SWOT analysis

強項 (S)	弱項 (W)
<ul style="list-style-type: none"> ● 學校現在初中開辦通識教育，幫助學生建立批評性思維，教導學生對學習內容作深入思考 ● 通識科老師掌握高層次提問技巧和使用探究式學習方法 	<ul style="list-style-type: none"> ● 本校學生普遍欠缺自信 ● 學習動機較弱，欠缺主動性 ● 專注力較低，缺乏好奇心 ● 只有小部分老師接受思維培訓課程
機會 (O)	危機 (T)
<ul style="list-style-type: none"> ● 讓同學從初中至高中階段學習到獨立思考能力，明辨是非的能力。 ● 提出和評論議題的能力，提升將來對社會或政府的監察 ● 教師有機會強化思維的培訓 	<ul style="list-style-type: none"> ● 能力較弱或自制能力較差的學生，未能適應這些教學方法 ● 學生有可能把爭論變成爭吵甚至吵架

Table 6: Sample 14 on SWOT analysis

強項 (S)	弱項 (W)
<ul style="list-style-type: none"> ● 部分老師都正在充分裝備自己積極進修 ● EMB 提供各種培訓，不用自己花費時間去尋找 ● 因有較強互動性，可吸引學生 	<ul style="list-style-type: none"> ● 學生主動性較弱 ● 校方不太注重科技教育，缺乏 TE 資源，包括老師及教材 ● 課程的課節時間太短
機會 (O)	危機 (T)
<ul style="list-style-type: none"> ● NSS 給予學校重新思考各科定位，與及重新檢視 EMB 對各個領域的要求 ● 另類的教學方法，可能對學生產生吸引力 ● 可用以訓練學生將思維用以投入生活中 	<ul style="list-style-type: none"> ● 由於校方只容許較弱學生選修 CIT，缺乏學生來源 ● 如果各科都同樣滲入思維培訓，形成重覆施教

Table 7: Sample 15 on SWOT analysis

強項 (S)	弱項 (W)
<ul style="list-style-type: none"> ● 老師已具備這方面的教學能力 ● 學校的支援充足 ● 各科也有相通相近的培訓 	<ul style="list-style-type: none"> ● 同學的學習較被動 ● 同學對抽象的東西(例如思維培訓)沒有興趣，也缺乏這方面學習能力
機會 (O)	危機 (T)
<ul style="list-style-type: none"> ● 同學學會這方面技巧，會幫助他們學習 ● 可提升同學學習的興趣 	<ul style="list-style-type: none"> ● 拖慢課程的教學進度