學生做完習題之後，您可以問以下的問題：

- 告訴我，解這道題要用什麼步驟？

- 講給我聽，你是怎樣解這道題的？

- 如果我將這個條件改了，你還可以解這道題嗎？

- 如果…這道題會變成怎樣？

- 你可以用另一種方法來解這道題嗎？

- 你可以從這道題摸索到一些規律嗎？

- 根據這個規律，下一步會是什麼？

- 你這樣做的原因是什麼？

When they think they have finished:

- Tell me what you had to do.

- Show me how you solved the problem.

- Could this still be done if I changed...?

- What would happen if...?

- Could you have used another method to solve this?

- Have you found any pattern?

- How would the pattern continue?

- Why is this?

如果學生卡住了，習題無法繼續做下去，您可以這樣告訴他們：

- 留心看看有沒有什麼規律。

- 嘗試畫個圖、解一解。

- 嘗試一下整理數字、列成圖表。

- 猜一猜答案是什麼，然後核對一下。

- 首先做另一道相似的問題。

- 先把問題中重要的資料寫下來。

- 從實際角度來想一下這道問題。

- 先將要用的方程式寫下來。

- 換一個角度來想這道問題。

Stuck?

- Look for a pattern.
- Draw a picture.
- Make a list or chart.
- Guess and check.
- Solve a similar problem first.

- Write down important information.

- Act out the problem.

- Write an equation.

- Change your point of view.

如果學生仍然沒有什麼進展，您還可以這樣做：

● 叫學生用自己的方法重新理解這道問題。

● 弄清楚學生是否完全了解問題中的所有字和詞。

● 叫學生將他們剛剛做完的重覆一次給你看。

● 問學生"你試過用另一種方法嗎？你有沒有做過類似的問題？"

● 如果有需要，給學生一點提示。

Still stuck?

● Ask them to re-state the problem in their own words.

● Check that they know the meanings of particular words and phrases.

● Have them show you what they have done.

● "Could you have done this another way? Have you ever seen a problem like this before?"

● If necessary, give a small hint.

小組協作的好處

- 學生學業上會有進步

- 學生可以發展歧異型思考

- 學生的動機得以提高

- 學生可以獨立地學習

- 學生的自尊心得以提高

- 學生的學習態度會變得更積極

- 學生可以學會互相尊重、互相關心

- 學生可以學會了解和接受個體之間的差異

Co-operative Groupwork: Benefits

- higher academic achievement

- divergent thinking

- motivation

- autonomous learning behaviour

- positive self-esteem

- positive attitudes

- mutual respect and concern for others

- acceptance and understanding of individual differences

融匯貫通對所有人來說都是非常重要的。

學生首先應該學會互相尊重，然後才能夠和諧相處。

今時今日，我們需要發展的素質包括：在精神上的融匯貫通、發乎內心的愛以及合作精神

例如，在課室和操場，我們應該強調高層次的協作、為團隊作出犧牲、同情條件較差的同學等等。

Unity is vital for all.

Students should start with cultivating the spirit of mutual regard and harmony.

Unity of minds, natural love and co-operation are the qualities we have to develop today.

By example, in the classroom and the playground, the excellence of intelligent co-operation, of sacrifice for the team, of sympathy for the less gifted, of help...has to be emphasised.

協作學習並**不單是**：

- 將學生分做幾個小組，以為這樣協作就會出現

- 學生在單獨地做功課時，一起共用某些資源

- 讓學生在單獨地做功課時交談

- 由一個學生負責小組的工作

Co-operative learning is not simply:

- sitting children in small groups, hoping they will co-operate
- sharing materials while working on individual tasks
- having children talk to each other while each doing their own work
- having one child do the group's work

協作學習的意思是：

● 正面的互相依賴

● 小組有共同的目標：共同為一件事或某種結果而努力

● 小組成員的工作就是整個小組的工作：每個人對小組都有貢獻

  （ "如果我做得好的話，我們整個小組都會做得好" ）

● 承認所有小組成員的貢獻相等

● 小組成員要為工作負上個人責任

● 分享資源、分擔角色和工作

● 分擔領導的責任

Co-operative learning means:

● positive interdependence

● a group goal - joint product or single outcome

● a group task - everyone is a contributor ("If I do well, we all do well")

● equal recognition for all group members

● individual accountability

● sharing of materials, roles, labour

● sharing of leadership

我們必須將協作的學習技巧教授給學生。

小組中的成員各有特色：“由於小組多元化特色，成員可以更好地互相學習”。

學生有責任了解和評估本身的團隊協作技巧。

Social/co-operative learning skills have to be taught.

Heterogenous groups: "It is the mix of difference that makes it a powerful way to learn".

Pupils are responsible for monitoring and evaluating their groupwork skills.

小組協作: 教師扮演的角色

介紹

1.向學生介紹有關小組協作的概念，並在需要時重溫這些概念

2.讓學生首先嘗試解答問題的一小部分或另一道相似但較簡單的問題

3.將要解決的問題表達出來

4.與學生討論，確保他們明白要做的是什麼

Co-operative Groupwork: The Teacher's Role

Introducing

1. present or review concepts that are needed.

2. Pose a part of the problem or a similar but smaller problem for pupils to try.

3. Present the problem to be solved.

4. Discuss to make sure pupils understand what they are supposed to do.

探索

1.觀察小組成員的交流，聆聽他們的意見

2.在適當的時候提供協助，但在其他時候應該保持緘默

3.問一些問題，以確定小組成員明白要做什麼東西

4.提供額外活動讓較快完成的小組參與

Exploring

1. Observe the interaction, listen to groups' ideas

2. Offer assistance when needed - but keep quiet when it is not!

3. Ask questions to establish whether the group members are understanding the task.

4. Provide an extension activity for groups that finish early.

<u>總結</u>

1.讓小組成員反思工作的過程，包括工作的程序和策略

2.讓小組作報告、解釋他們的答案

3.從答案歸納出一些規律

<u>Summarizing</u>

1. Have groups share their processes - procedures and strategies

2. Have groups present solutions

3. Generalize from the solutions

教師可以扮演學習促進者的角色

- 把這個重點解釋給我知道。

- 這是什麼意思？

- 你怎樣得到這個答案？

- 你覺得下一個步驟是什麼？

- 你可不可以解釋一下這一點？

- 你用什麼方法得到這個答案？

- 看到這道問題，你第一步／下一步會做什麼？

- 你是怎樣找到答案的？

- 為什麼你一定要做這一步？

Teacher as Facilitator

- Tell me about this.

- What does this mean?

- How did you get that?

- What did you think about next?

- Can you explain...?

- What did you do to get this?

- What is the first/next thing you think of?

- How did you figure that out?

- Why is this step necessary?

小組協作：學生扮演的角色

在不同的活動，學生可以扮演不同的角色

<u>領導</u>

- 領導要確保每次只有一個人發言，而他/她說話時也不應太大聲

- 領導要確保小組專心工作

- 領導要鼓勵所有小組成員都有作出貢獻

Co-operative Groupwork: The Students' Roles

These can be changed for each new activity.

<u>Leader</u>

- Make certain only one person speaks at a time and that the noise level does not become too loud.

- Make certain the group works on the task.

- Encourage all group members to contribute.

記錄員

記錄小組的工作程序和結果，並作出總結

時間記錄員

記錄小組花在不同工作的時間

提醒小組成員還餘下多少時間

報告員

向班上其他同學作報告

Recorder

Record and summarise the group's procedures and results.

Time-keeper

Pay attention to time spent on different aspects of task

Remind group of time deadlines

Reporter

Reports to class

用什麼策略可以減少成員對教師的依賴

● 教師可以與小組成員討論他們的角色和責任

● 運用一些工具，令學生可以自行核對進度

● 查看學校有沒有提供某些儀器，以及作出適當的安排

● 提供一些資源，讓學生將結果記錄下來

● 訂下一個大概的時限讓學生完成有關的活動

● 計劃一些額外活動，讓學習困難的學生有更多練習機會；同時

　　為資優學生準備一些有挑戰性的問題

Strategies for making activities independent of the teacher

● Discuss with group members their roles and responsibilities

● Use self-checking devices

● Check availability and organisation of equipment

● Provide materials for children to record findings

● Give approximate timeframe for completion of activities

● Plan extra activities to give more practice to children having

difficulties, or extension for those who finish early.

反思

- 從這個活動，學生可以學到什麼數學知識和技巧？

- 從這個活動，學生可以發展那些社交技能和性格素質？

- 你可以怎樣將這個活動修改一下，在教學中應用？

- 你可以問什麼問題，評估學生學到了什麼？

Reflection

- What mathematical knowledge and skills were learnt from this activity?

- What social skills or character development were promoted?

- How would you have to modify this activity to use in your own teaching?

- What key questions can you ask to assess how much the pupils have learned?

設計以問題解決為本的課堂

1.你所設計的課堂，是否仍然以教師為本？

● 有什麼資料是你一定要告訴學生的？

● 有什麼是你希望學生自己去發現的？

2.這個問題適合嗎？（換言之，學生可能未必立刻知道怎樣做這道問題。）

Creating a problem-solving lesson

1. Have you planned for less teacher talk?

● What essential information must you give?
● What do you want the children to discover for themselves?

2. Is the "problem" really a problem? (This means that the children will not immediately know how to go about solving it.)

3.學生需要預先具備什麼知識才能解答這道問題？

4.學生是否有機會自己去發現數學原理，以及自己去測試這個原理？

5.教師應該發問什麼問題去引導學生思考？

6.學生需要什麼輔助材料？

3. What previous knowledge do they need to draw on to solve the problem?

4. Is there opportunity for the children to discover a rule and to try several cases to test the rule?

5. What questions might the teacher need to ask to guide the children's thinking?

6. What materials are required?