

Teaching programming for Secondary 1-3 Computer Literacy Syllabus (New)

Speaker: Dr KI Wing-wah

Resource Package: L&T resource package for the Programming Modules of the CL Syllabus

Development Team: Dr Alvin Kwan, Dr Felix Siu,
Mr Chan Yuk-ming, Mr Evans Ng

Project carried out at CITE, HKU
Commissioned by EDB, Hong Kong SAR Government

Programme Description

(1) Rationales and the design of the resource package <ul style="list-style-type: none">• Why teaching programming in Computer Literacy?• Learning critical thinking and problem solving through programming?	20mins
(2) Relevant learning and teaching materials <ul style="list-style-type: none">• What are included in the package? Why LOGO and Visual Basic?	20mins
(3) Features of the LOGO and related pedagogies <ul style="list-style-type: none">• Its design philosophy; the exploratory environment it provides• Effective strategies in teaching programming in LOGO• Modular approach, debugging techniques and good style• Examples in the resource package	45mins
(4) Question and Answer	15mins
Break	20mins
(5) Features of Visual BASIC and related pedagogies <ul style="list-style-type: none">• Its design philosophy; the exploratory environment it provides• Effective strategies in teaching programming in Visual Basic• modular approach, debugging techniques and good style• Examples in the resource package	45mins
(6) Question and Answer	15mins

Rationales and the design of the resource package: critical thinking and problem solving through programming

- Why teaching programming in Computer Literacy?
 - Why have we moved away from programming?
 - Why do we think that is not enough?
 - Why has the teaching of programming been not effective
 - How can we provide useful situations and guidance for the learning of programming?
- Learning critical thinking and problem solving through programming?
 - What constitute critical thinking?
 - Can such habits of mind be practiced in programming?

Why teaching programming in Computer Literacy?

- Why have we moved away from programming?
 - Students find it difficult
 - You don't need programming ability to use software
 - 'consumer culture'
- Why do we think that is not enough?
 - Less basic understanding of what computer can/cannot do
 - Less appreciation of the development of human wisdom
 - Less creativity:
 - in questioning the existing
 - imagining more possibilities
- Why has the teaching of programming been not effective?
 - Teaching the commands and assuming they can put them together in a meaningful way
 - Motivational issue
 - Involves complex skills →
 - takes a long time to learn the basics before really able to do something meaningful →
 - Common motivational problem in bottom-up learning

How can we provide useful situations and guidance for the learning of programming?

- Meaningful learning
 - Learning commands in context
 - Context - examples related to the world experience / interest of students
 - Representing it in a new way
 - Lead us to questions for further thinking
- Minimalist Approach + Variation
 - Choose a limited scope that can achieve simple meaningful purpose
 - First give them short examples / instructions to achieve the purpose
 - Backtrack to vary what has been done to explore more functions of the system
 - Think further about improvement and extensions
- Understanding goes from a rough idea of the whole to the details
- Backward chaining approach in lesson implementation
 - What you want in the end (a 1.5 year infant):
 - 1 search my pocket -> 2 remove the wrap → 3 put candy in the mouth
 - How would you do the training?
 - Let the infant learn me step by step 1, 2, 3 and let the infant imitate?
 - The Backward Chaining Approach suggests the opposite

- Of course all of us learn 'step by step',
- but we need to clarify what it actually means
- The crux of the matter is the relation between the steps
 - What two things should be put together among the so many?
 - For example, do we teach
 - first the uses of "=" in a number of contexts
 - Then the uses of "if" in a number of contexts
 - What are the advantage and disadvantage?
 - Can we
 - first teach "=" and then "if" in one context
 - Then teach "=" and then "if" in another context
 - What are the advantage and disadvantage?

Critical Thinking and problem solving in programming

- We all learn & explore 'step by step'.
- The crux of the matter is the relation between the steps
 - Does the transition make sense to the learner
 - Does the learner take part in deciding what to do next?
 - What sort of view of knowledge do we take?
 - Linear ? Spiral
- What helps
 - Zone of proximal development & scaffolding
 - Recap experience
 - Directing attention to certain part of the thing
 - Bringing attention to related things
 - Suggesting a number of possible options for them to choose
 - (some may work and some may not)
 - Variation of the goal
 - Treating small success a big success
 - Treating error debugging as learning
 - Room and positive attitude for alternative solutions and sharing
 - Learning in pairs / group

What does the package provide?

- Follows Computer Literacy Curriculum Guide (CDC 1999)
- LOGO (6 teaching units), VB (6 teaching units)
- Free programs
 - mswLOGO,
 - Visual Basic Version 5 CCE (better on Eng Windows)
 - The VB materials also run on Visual Basic Version 6
- Overall Teaching Plan and 8 Projects for LOGO
- Overall Teaching Plan and 8 Projects for VB
- Learning materials & resources on each unit
 - Notes / interactive learning materials
 - Examples (description & program codes)
 - Practical tasks (description & program codes) at elementary / intermediate / advanced levels
 - Assessment tasks (description & program codes)
- Both Chinese and English version
- For trial: www.dragonwise.hku.hk/computer_literacy