Computational Algorithm Thinking Intermediary with Javascript

For the course, we won't teach basic HTML and CSS as we assume student has already finished CSD U2 - Web development and CSD U3 - Animation and Game Development successfully and have research capability to find out information related to HTML and CSS.

It fits for both Inspire (SHU) and Academy HA Level students. There will be different requirement as time constraints we have. I will put SHU - Inspire student, HA - Academy students in this course so that there will right guidance for students.

The following highlights three things in the course: concepts, problem solving and algorithm thinking.

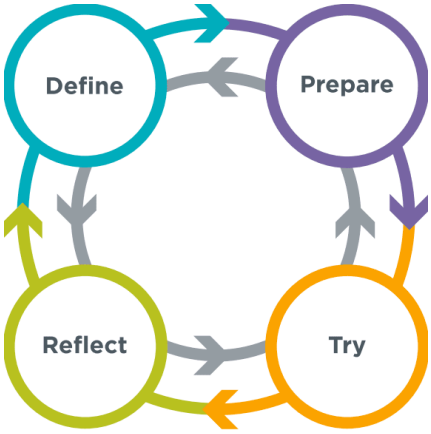
Concepts

Review and have more depth understanding of
- HTML
- Styling text, elements and images with CSS
- Images
- Javascript Programming
- Random Numbers and Math Operations
- Conditionals
- Keyboard Inputs
- Mouse Inputs
- Functions
- Functions with Parameters
- Canvas

All above are required for both SHU (Inspire) and HA (Academy) students.

Through projects, we will connect every part knowledge tonight and understand several partterns
- Input Pattern (SHU - Inspire and HA - Academy)
- Model, View and Control (HA - Academy)
- Test Driven Development (HA - Academy)

Problem Solving



Define
• Understanding Requirements / Challenges (SHU - Inspire and HA - Academy)
• List requirements/challenges with templates (SHU - Inspire, HA - Academy)
• Understanding constraints (HA - Academy)

Prepare
• Analysis with Flowchart (SHU - Inspire and HA - Academy)
• Implement with Flowchart (SHU - Inspire and HA - Academy)
• Bottom Up (SHU - Inspire and HA - Academy)
• Top down design (SHU - Inspire and HA - Academy)
• Research (SHU - Inspire and HA - Academy)
• Critical Thinking (HA - Academy)

Try and Reflect
• Debug with development tools (SHU - Inspire and HA - Academy)
• Patterns to identify cause of problem (HA - Academy)
• Launch projects live and get feedbacks (HA - Academy)

Computational Algorithm Thinking

Decomposition

• Top down design (SHU - Inspire and HA - Academy)
• Bottom up (SHU - Inspire and HA - Academy)
• Testing functions (HA - Academy)

Pattern Recognition
• Input Pattern (Loops) (SHU - Inspire and HA - Academy)
• Artistic Shape with Nest Loops and Canvas (SHU - Inspire and HA - Academy
• Model, View and Control (HA - Academy)

Algorithms
• Use Algorithms to represent pattern in games
• Use Algorithms to represent artistic patterns with Canvas
• Game AI for board games

Unit 1 - Games

The unit will take 10 to 15 weeks depending on students. Please note that Academy student must finish this unit by 10 weeks and with 4 weeks on final project. As coach in Academy, please make sure all the contents will be finished in 6 weeks.

Lesson 1: Setup Development Environment

Through the lesson, student will have environment setup for development with HTML, CSS and Javascript. We will introduce tools including:
* Chrome Developer Tools
* Install Visual Studio Code with Live Server

And in the lesson, students needs to review what they have learned CSD U2 - Web Development by modify webpage with HTML.

Problem solving:
- Define
  - Understanding problem and challenges
- Prepare
  - Research
- Try and Reflect
  - Development tools and Debugging
  - Console

Lesson 2: Guess Number Game (1)

With the guess number game, student will understand:

* How to use javascript to program
* Review HTML
* Math Functions in Javascript including Random, Floor
* Functions: Alert

Problem Solving
- Define
  - Understanding problem and challenges
- Prepare
  - Research
- Try and Reflect
  - Debugging Logic with Tool

Algorithm Thinking

- Decomposition
  - Test function with development tools and console log
  - Breakpoint setup
  - Watch
- Patterns
  - Input and Loop Pattern

Lesson 3: Guess Number Game (2)

In this lesson, we will grow number game into next stage with

* Javascript Function
* CSS and Bootstrap
* DOM Operations for Div, Button and others
* Functions:document.getElementById

Problem Solving
- Define
  - Understanding problem and challenges
- Prepare
  - Research
- Try and Reflect
  - Debugging Logic with Tool

Algorithm Thinking

- Decomposition
  - Test function with development tools and console log
  - Breakpoint setup
  - Watch
- Patterns
  - Input and Loop Pattern
  - Model, View and Controller Pattern (HA - Academy Only)

Lesson 4: Dragon Realm Game (1)

This week, we will learn algorithm including:

* Decomposition (focus on requirements one by one and test them)
* Loop Patterns (While True, For Loops)

Problem Solving
- Define
  - Understanding problem and challenges
- Prepare
  - Research
- Try and Reflect
  - Debugging Logic with Tool

Algorithm Thinking

- Decomposition
  - Break into smaller pieces
  - Test function with development tools and console log
  - Breakpoint setup
  - Watch
- Patterns
  - Input and Loop Pattern
  - Model, View and Controller Pattern (HA - Academy Only)

Lesson 5: Dragon Realm Game (2)

This week ,we will further learn algorithm thinking including:

* Top Down Design
* Flow Chart
* How to implement code basing on Flowchart

Problem Solving
- Define
  - Understanding problem and challenges
- Prepare
  - Research
  - Top Down Design
- Try and Reflect
  - Debugging Logic with Tool

Algorithm Thinking

- Decomposition
  - Break into smaller pieces
  - Test function with development tools and console log
- Patterns
  - Input and Loop Pattern
  - Model, View and Controller Pattern (HA - Academy Only)

Lesson 6: Dragon Realm Game (3)

Apply all the learning on the optional tasks esp on the shop function on the game.

Problem Solving
- Define
  - Understanding problem and challenges
- Prepare
  - Research
  - Top Down Design
- Try and Reflect
  - Debugging Logic with Tool

Algorithm Thinking

- Decomposition
  - Break into smaller pieces
  - Test function with development tools and console log
- Patterns
  - Input and Loop Pattern
  - Model, View and Controller Pattern (HA - Academy Only)

Lesson 6 - Homework: Hangman GAME (1)

We will focus on
* Flow chart
* Top Down Design
* Implement Code basing on Flowchart

Lesson 7: Hangman GAME (2)

We will focus on
* Flow chart
* Implement Code basing on Flowchart
* Data structure - Array
* Functions
* Bottom Up

Problem Solving
- Define
  - Understanding problem and challenges
- Prepare
  - Research
  - Top Down Design
- Try and Reflect
  - Debugging Logic with Tool

Algorithm Thinking

- Decomposition
  - Break into smaller pieces
  - Test function with development tools and console log
- Patterns
  - Input and Loop Pattern
  - Model, View and Controller Pattern (HA - Academy Only)

Lesson 8: Hangman GAME (3)

We will focus on
* Implement Code basing on Flowchart
* Data Structure - Array
* Functions
* Bottom Up

Problem Solving
- Define
  - Understanding problem and challenges
- Prepare
  - Research
  - Top Down Design
- Try and Reflect
  - Debugging Logic with Tool

Algorithm Thinking

- Decomposition
  - Break into smaller pieces
  - Test function with development tools and console log
- Patterns
  - Input and Loop Pattern
  - Model, View and Controller Pattern (HA - Academy Only)

Lesson 9 -10: Project

Student will choose their own text based game project in lesson 9 and 10. They will apply learning in the two weeks project including:

* Top Down Design
* Flowchart
* Write Skeleton Code basing on flowchart
* Bottom Up implementation and Testing
* Data Structure - Array
* Functions

Problem Solving

- Define
  - Understanding problem and challenges
- Prepare
  - Research
  - Top Down Design
- Try and Reflect
  - Debugging Logic with Tool

Algorithm Thinking

- Decomposition
  - Break into smaller pieces
  - Test function with development tools and console log
- Patterns
  - Input and Loop Pattern
  - Model, View and Controller Pattern (HA - Academy Only)

Unit 2 - Game AI and Artistic Patterns

The unit will take 10 to 15 weeks depending on students. Please note that Academy student must finish this unit by 10 weeks and with 4 weeks on final project. As coach in Academy, please make sure all the contents will be finished in 6 weeks.

This term will focus more on algorithm than problem solving esp on the pattern and algorithm side of computer science.

Lesson 1 - TIC TAC TOE Game (1)

Concepts include
- Top down design
- Flowchart
- Skeleton Program Creation
- Data Structures
- Functions

Problem Solving
- Define
  - Understanding problem and challenges
- Prepare
  - Research
  - Top Down Design
- Try and Reflect
  - Debugging Logic with Tool

Algorithm Thinking

- Decomposition
  - Break into smaller pieces
  - Test function with development tools and console log
- Patterns
  - Input and Loop Pattern
  - Model, View and Controller Pattern (HA - Academy Only)

Lesson 2 - TIC TAC TOE Game (2)

Concepts include
- Skeleton Program Creation
- Functions
- Data Structures
- Game AI

Problem Solving
- Define
  - Understanding problem and challenges
- Prepare
  - Research
  - Top Down Design
- Try and Reflect
  - Debugging Logic with Tool
  - Test Driven Developement (HA - Academy Only)
  - Google Analytics (HA - Academy Only)
  - Surveys and Interviews (HA - Academy Only)

Algorithm Thinking

- Decomposition
  - Break into smaller pieces
  - Test function with development tools and console log
- Patterns
  - Input and Loop Pattern
  - Model, View and Controller Pattern (HA - Academy Only)

Lesson 3 - TIC TAC TOE Game (3)

Concepts include
- Skeleton Program Creation
- Functions
- Game AI
- FTP (HA - Academy)
- Web Servers (HA - Academy)

Problem Solving
- Define
  - Understanding problem and challenges
- Prepare
  - Research
  - Top Down Design
- Try and Reflect
  - Debugging Logic with Tool
  - Test Driven Developement (HA - Academy Only)

Algorithm Thinking

- Decomposition
  - Break into smaller pieces
  - Test function with development tools and console log
- Patterns
  - Input and Loop Pattern
  - Model, View and Controller Pattern (HA - Academy Only)

Lesson 4-5 Board Game Project

Concepts include
- Top down design
- Flowchart
- Skeleton Program Creation
- Data Structures
- Functions
- Game AI
- FTP (HA - Academy)
- Web Servers (HA - Academy)

Problem Solving
- Define
  - Understanding problem and challenges
- Prepare
  - Research
  - Top Down Design
- Try and Reflect
  - Debugging Logic with Tool
  - Testing Driven Development (HA - Academy Only)
  - Google Analytics (HA - Academy Only)
  - Surveys and Interviews (HA - Academy Only)

Algorithm Thinking

- Decomposition
  - Break into smaller pieces
  - Test function with development tools and console log
- Patterns
  - Input and Loop Pattern
  - Model, View and Controller Pattern (HA - Academy Only)

Lesson 6 - Artistic Pattern - Loop

Concepts include
- Canvas
- Loop Patterns

Problem Solving
- Define
  - Understanding problem and challenges
- Prepare
  - Research
  - Top Down Design
- Try and Reflect
  - Debugging Logic with Tool
  -

Algorithm Thinking

- Decomposition
  - Break into smaller pieces
  - Test function with development tools and console log
- Patterns
  - Input and Loop Pattern
  - Artistic Loop Patterns
  - Model, View and Controller Pattern (HA - Academy Only)

Lesson 7 - Artistic Pattern - Nested Loop (1)

Concepts include
- Canvas
- Nested Loop Patterns

Problem Solving
- Define
  - Understanding problem and challenges
- Prepare
  - Research
  - Top Down Design
- Try and Reflect
  - Debugging Logic with Tool

Algorithm Thinking

- Decomposition
  - Break into smaller pieces
  - Test function with development tools and console log
- Patterns
  - Input and Loop Pattern
  - Artistic Nested Loop Patterns
  - Model, View and Controller Pattern (HA - Academy Only)

Lesson 8 - Artistic Pattern - Nested Loop (2)

Concepts include
- Canvas
- Nested Loop Patterns

Problem Solving
- Define
  - Understanding problem and challenges
- Prepare
  - Research
  - Top Down Design
- Try and Reflect
  - Debugging Logic with Tool

Algorithm Thinking

- Decomposition
  - Break into smaller pieces
  - Test function with development tools and console log
- Patterns
  - Input and Loop Pattern
  - Artistic Nested Loop Patterns
  - Model, View and Controller Pattern (HA - Academy Only)

Lesson 9 - 10 Project : Your Art Work

Concepts include
- Canvas
- Loop Patterns
- Nested Loop Patterns

Problem Solving
- Define
  - Understanding problem and challenges
- Prepare
  - Research
  - Top Down Design
- Try and Reflect
  - Debugging Logic with Tool

Algorithm Thinking

- Decomposition
  - Break into smaller pieces
  - Test function with development tools and console log
- Patterns
  - Input and Loop Pattern
  - Artistic Loop Patterns
  - Artistic Nested Loop Patterns
  - Model, View and Controller Pattern (HA - Academy Only)