

Topic 2.3.1 – Defensive design: Lesson 1 – Defensive design considerations

The big picture

Why is this relevant for the students?

1. Ask students how many times they enter personal data into a system?

Notes: Use Context Setting task to engage students and create discussion.

May link to flipped resources if you use flipped learning.

Objectives

What should the students be confident/able to do at the end of the session?

- Understand the principles of defensive design.
- Recognise and describe how programs may be misused by users.
- Understand different authentication methods.

Notes: These are the core learning that the students should develop during the lesson. This will link to the activities that provide ability to assess the Objectives.

Engagement

How will I encourage engagement?

Ask students to watch a video and answer the following questions:

1. What caused the SONY hack?
2. What are the outcomes of this hack?
3. How could SONY have prevented the attack?
4. How might SONY alter their programs to prevent this kind of attack in the future?

Notes: A short activity that stimulates the students. Ideas taken from big picture activity could be used.

Assessment for Learning

Expected progress

Define the terms:

- robust
- misuse
- defensive Design
- authentication.

Good progress

- Begin to understand the principles of defensive design and different authentication methods.

Exceptional progress

- Apply defensive design and authentication methods to real world problems.

The sticking points

What activities will the students undertake?

- Watch the Sony Hack video and answer questions.
- Discuss the importance of defensive design.
- Describe authentication methods for different programs.

Notes: A list of concepts that you want the students to remember by the end of the lesson.

Keywords

Students should be able to use the following words confidently:

- robust
- misuse
- defensive design
- authentication.

Notes: Multiple Choice Questions will assess these keywords; use the MCQs supplied. You may wish to customise these as needed.

Notes

Differentiation

How will I enable access to each area of learning for my students?

- Activity 1 – differentiated worksheets for low, middle and high.
- Activity 2 – differentiated worksheets for low, middle and high.

Notes: Use of stretch task ideas supplied may support high end differentiation. You will need to modify the resources to meet the needs of your students specifically. You may wish to refer to Departmental or School policies on differentiation methods used within your centre.

Activity 1

What tasks will I ask the students to complete to develop their understanding during the lesson?

For a program of your choice, discuss the importance of defensive design. What might happen if the programs are defensively weak?

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs. Reference the Common Misconceptions/FAQ guide to support your delivery of the topic.

Activity 2

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Make a list of programs where authentication is required and what type of authentication happens e.g. Facebook Login – Password.
- Describe your authentication method to the class and how it provides good defensive design.

Summary/Plenary**Use MCQs here**

- Ask students to work in pairs to test each other on the key term definitions:
 - What is meant by the term authentication?
 - Describe one disadvantage of using authentication in a program?
- Ask students to add to each other's definitions to make sure they are complete.

Notes: Use the MCQs to check basic understanding of keywords and topics.

Use the LOR to develop deeper knowledge and allow Peer Assessment and Review. This can be developed to use the LOR ideas as homework etc.

Topic 2.3.1 – Defensive design: Lesson 2 – Input validation

The big picture

Why is this relevant for the students?

1. Students need to know why inputting strong data is crucial to an individual and a business.

Notes: Use Context Setting task to engage students and create discussion. May link to flipped resources if you use flipped learning.

Objectives

What should the students be confident/able to do at the end of the session?

1. To understand the different validation methods when entering data.

Notes: These are the core learning that the students should develop during the lesson. This will link to the activities that provide ability to assess the Objectives.

Engagement

How will I encourage engagement?

- Make a list of where you commonly enter data.
How much of this is personal data?
- When data is entered into a program it is important that it is valid in order for the program to operate correctly.
- Sometimes users will deliberately enter incorrect or 'spam' data in an attempt to access a program or the program code.

Notes: A short activity that stimulates the students. Ideas taken from big picture activity could be used.

Assessment for Learning

Expected progress:

- Explain how validation aids defensive design.

Good progress:

- Complete the table with little help and can explain what the different validation types are.

Exceptional progress:

- Explain the different types of validation types.
- Complete table with no help.
- Be able to give real world example of where the validation types would be tested on input.

The sticking points

What activities will the students undertake?

- Make a list of commonly input data.
- Complete the card sort and create the table.

Notes: A list of concepts that you want the student to remember by the end of the lesson.

Keywords

Students should be able to use the following words confidently:

- validation
- input
- authentication

Notes: Multiple Choice Questions will assess these keywords; use the MCQs supplied. You may wish to customise these as needed.

Notes

Differentiation

How will I enable access to each area of learning for my students?

- Activity 1 can be differentiated by revealing/hiding data from the table e.g. high ability would use a blank table. Low ability would have some of the data available.

Notes: Use of stretch task ideas supplied may support high end differentiation. You will need to modify the resources to meet the needs of your students specifically. You may wish to refer to Departmental or School policies on differentiation methods used within your centre.

Activity 1

What tasks will I ask the students to complete to develop their understanding during the lesson?

Sort the cards into the correct order then create a table of the:

- name of the validation technique
- a definition
- an example.

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs. Reference the Common misconceptions/FAQ guide to support your delivery of the topic.

Summary/Plenary

Describe three things that can be implemented to make a password based authentication system more robust?

Notes: Use the MCQs to check basic understanding of keywords and topics.

Use the LOR to develop deeper knowledge and allow Peer Assessment and Review. This can be developed to use the LOR ideas as homework etc.

Topic 2.3.1 – Defensive design: Lesson 3 – Sub programs

The big picture

Why is this relevant for the students?

1. Explain to students that when programmers write code they break it down.
2. We will look at how its broken down and the benefits.

Notes: Use Context Setting task to engage students and create discussion. May link to flipped resources if you use flipped learning.

Objectives

What should the students be confident/able to do at the end of the session?

- Understand the benefit of using sub programs when programming.

Notes: These are the core learning that the students should develop during the lesson. This will link to the activities that provide ability to assess the Objectives.

Engagement

How will I encourage engagement?

- When EA developed FIFA did they have one huge block of code?
- Explain why.
- Can you give examples of how it could be broken down?

Notes: A short activity that stimulates the students. Ideas taken from big picture activity could be used.

Assessment for Learning

Expected progress:

- Identify the main benefits of using sub programs.

Good progress:

- Be able to explain the benefits of using sub programs.
- Explain how a program uses sub programs.

Exceptional progress:

- Create sub programs from scratch.
- Explain how sub programs might be used in the real world e.g. FIFA.

The sticking points

What activities will the students undertake?

- Students to discuss how a program of their choice, using sub programs improves maintainability.

Notes: A list of concepts that you want the student to remember by the end of the lesson.

Keywords

Students should be able to use the following words confidently:

- Sub program
- Procedure
- Function
- Maintainability

Notes: Multiple Choice Questions will assess these keywords; use the MCQs supplied. You may wish to customise these as needed.

Notes

Differentiation

How will I enable access to each area of learning for my students?

- High ability students could create their own functions and procedures.
- Low ability could be given the function and procedures.

Notes: Use of stretch task ideas supplied may support high end differentiation. You will need to modify the resources to meet the needs of your students specifically. You may wish to refer to Departmental or School policies on differentiation methods used within your centre.

Activity 1

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Printscreen a function or procedure that you have written in a previous lesson.
- Describe how you have made the program much more maintainable by writing sub programs.
- Explain the benefits of creating sub programs in this way?

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs. Reference the Common Misconceptions/FAQ guide to support your delivery of the topic.

Summary/Plenary

- Use MCQs for the topic.
- Describe three ways in which sub programs improve maintainability?

Notes: Use the MCQs to check basic understanding of keywords and topics.

Use the LOR to develop deeper knowledge and allow Peer Assessment and Review. This can be developed to use the LOR ideas as homework. etc.

Topic 2.3.1 – Defensive design: Lesson 4 – Naming conventions/indentation

The big picture

Why is this relevant for the students?

1. Ask students whether they have looked someone else code and it has not made sense? Why?
2. Why do programmers use meaningful variable names?

Notes: Use Context Setting task to engage students and create discussion. May link to flipped resources if you use flipped learning.

Objectives

What should the students be confident/able to do at the end of the session?

- Understand how naming conventions improve maintainability.
- Understand how indentation improves maintainability.

Notes: These are the core learning that the students should develop during the lesson. This will link to the activities that provide ability to assess the Objectives.

Engagement

How will I encourage engagement?

1. With the person sat next to you, discuss which of these variable names is the most meaningful and why?
 - SA
 - Surfacearea
 - Surface_Area

Notes: A short activity that stimulates the students. Ideas taken from big picture activity could be used.

Assessment for Learning

Expected progress

- Be able to identify meaningful naming conventions and the benefits of indentation.

Good progress

- Describe how a programs maintainability can be improved using indentation.

Exceptional progress

- Create their own program using meaningful naming conventions and indentation, discussing what the benefits are.

The sticking points

What activities will the students undertake?

- Students to discuss how a program of their choice, using naming conventions improves maintainability.
- Describe how a program's maintainability can be improved using indentation.

Notes: A list of concepts that you want the student to remember by the end of the lesson.

Keywords

Students should be able to use the following words confidently:

- Maintainability
- Convention
- Indentation

Notes: Multiple Choice Questions will assess these keywords; use the MCQs supplied. You may wish to customise these as needed.

Notes

Differentiation

How will I enable access to each area of learning for my students?

- Lower ability students could be given a piece of code and comment on how naming conventions have been used.
- Higher ability students could be told to create their own program from scratch using meaningful naming conventions

Notes: Use of stretch task ideas supplied may support high end differentiation. You will need to modify the resources to meet the needs of your students specifically. You may wish to refer to Departmental or School policies on differentiation methods used within your centre.

Activity 1

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Print Screen a program you have written and justify whether you have used good naming conventions.
- If you haven't, improve the naming conventions e.g. include capital letters and underscores.

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs. Reference the Common misconceptions/FAQ guide to support your delivery of the topic. Reference the Common Misconceptions/FAQ guide to support your delivery of the topic.

Summary/Plenary

Describe all of the ways in which this program could be more made more maintainable.

```
VAR A as Integer
A=Input ("What is your age?")
IF A>=18 THEN
Print("Yes you can watch an 18 rated movie")
ELSE
Print("Sorry you are not old enough to watch this
movie")
```

Notes: Use the MCQs to check basic understanding key words and topics.

Use the LOR to develop deeper knowledge and allow Peer Assessment and Review. This can be developed to use the LOR ideas as homework, etc.

Topic 2.3.1 – Defensive design: Lesson 5 – Commenting

The big picture

Why is this relevant for the students?

1. Ask students to consider how programmers manage to work in large teams, yet understand what their colleagues' code is doing.

Notes: Use Context Setting task to engage students and create discussion. May link to flipped resources if you use flipped learning.

Objectives

What should the students be confident/able to do at the end of the session?

- Understand the benefits of using comments.
- Explain how comments improve the maintainability of code.

Notes: These are the core learning that the students should develop during the lesson. This will link to the activities that provide ability to assess the Objectives.

Engagement

How will I encourage engagement?

Can you describe what this program is doing?

```
r = n / 2;
while ( abs( r - (n/r) ) > t ) {
    r = 0.5 * ( r + (n/r) );
}
```

System.out.println("r = " + r);

Notes: A short activity that stimulates the students. Ideas taken from big picture activity could be used.

Assessment for Learning

Expected progress

- Identify the benefits of using comments.

Good progress

- Be able to explain why comments improves maintainability.

Exceptional progress

- Explain how comments are used in the real world.
- Explore how different languages use different symbols to comment out code. Why might they do this?

The sticking points

What activities will the students undertake?

- Students to discuss how a program of their choice, using comments improves maintainability.
- Create a top tips poster to improve maintainability.

Notes: A list of concepts that you want the student to remember by the end of the lesson.

Keywords

Students should be able to use the following words confidently:

- Comment
- Execution
- Maintainability

Notes: Multiple Choice Questions will assess these keywords; use the MCQs supplied. You may wish to customise these as needed.

Differentiation

How will I enable access to each area of learning for my students?

- Lower ability students could be given a piece of code and explain how comments have been used.
- Higher ability students could be told to create their own program from scratch with comments

Notes: Use of stretch task ideas supplied may support high end differentiation. You will need to modify the resources to meet the needs of your students specifically. You may wish to refer to Departmental or School policies on differentiation methods used within your centre.

Summary/Plenary

- Play 'Pictionary': draw words/terms related to the lesson content.
- Evaluate a program(s) that you have written: Is it robust? Make a list of features that are and that are not.
- Apply defensive design to your own programs.

Notes: Use the MCQs to check basic understanding of keywords and topics.

Use the LOR to develop deeper knowledge and allow Peer Assessment and Review. This can be developed to use the LOR ideas as homework etc.

Activity 1

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Open up and old program that you have written.
- Include comments that describes the main sections of the program and why it works like it does.
- Why would programmers do this?

Notes: Use the Activities given to develop the students' knowledge of the topic. Each activity may need further differentiation/adaptation for your needs. Reference the Common misconceptions/FAQ guide to support your delivery of the topic. Reference the Common misconceptions/FAQ guide to support your delivery of the topic.

Activity 2

What tasks will I ask the students to complete to develop their understanding during the lesson?

- Create a simple 'Top 10 tips for effective coding' poster.
- For example:
 - add comments as you write the program and be polite
- Include examples and best practice.
- You could include screen shots and images.

Notes: Use the Activities given to develop the student's knowledge of the topic. Each activity may need further differentiation/adaptation for your needs. Reference the Common misconceptions/FAQ guide to support your delivery of the topic. Reference the Common misconceptions/FAQ guide to support your delivery of the topic.



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