Software Engineering Stage 6 (Year 11) – sample assessment task 2 notification

The object-oriented paradigm

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# Task description

**Type of task:** translate a classic role-playing adventure game (RPG) from a procedural paradigm to an object-oriented programming (OOP) paradigm using Python.

**Outcomes being assessed:**

A student:

* describes methods used to plan, develop and engineer software solutions **SE-11-01**
* explains how structural elements are used to develop programming code **SE-11-02**
* applies tools and resources to design, develop, manage and evaluate software **SE-11-06**
* applies language structures to refine code **SE-11-08**
* manages and documents the development of a software project **SE-11-09**

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**Suggested weighting:** 35%

Students use Python and an object-oriented approach to create a computer game based around a text-based role-playing adventure that was initially written in an imperative or procedural language.

The students’ game is to include an original scenario, characters and gameplay.

Students are encouraged to modify the classes, objects, attributes and methods of the guided solution to achieve this originality.

Students provide documentation including a journal and modelling diagrams

Students present their solutions to the class including a question and answer (Q&A) segment.

The teacher support resource includes a guided walkthrough of a solution based loosely on the historically famous Hunt the Wumpus.

**Teacher note:** this project can be adapted for use as a standalone sample assessment task of the object-oriented paradigm focus area. It has been designed to map to the syllabus content for this focus area. An alternative OOP/Mechatronic assessment task aligns with the published scope and sequence and will be available with published resources.

# Submission details

Students submit:

* workbook activities and challenges from the teacher support resource (TSR)
* an RPG text-based adventure game written using OOP in Python
* digital documentation including
* a journal documenting the progress and pitfalls
* (see [Gregory Yob’s account of the original version of Hunt the Wumpus](https://archive.org/details/CreativeComputingv01n05SeptemberOctober1975/page/n51/mode/2up?view=theater))
* a structure chart of the game
* a data dictionary
* a class diagram
* testing strategies that include sets of test data, that test the most common inputs and the appropriate expected results
* a complete copy of the code using internal and intrinsic documentation
* evaluation of the final game
* class presentation with Q&A session.

**Teacher note:** consider replicating industry practice by offering this task as groupwork and differentiating by permitting submission of programs that include graphics, media and other assets.

Opportunities should also be explored for students to peer assess their classmate’s work.

This will enable a forum for the exchange of ideas that may help inform future tasks and projects.

This project may be used to inform the design and development of the student’s Software Engineering project during the Year 12 course.

# Steps to success

Table 1 – assessment preparation schedule

|  |  |
| --- | --- |
| Steps | What I need to do |
| Identifying and defining  Investigate why object-oriented programming languages are suited to the development of computer games. | * Design the characters and the environment for your game. * Define these characters as objects. * Identify common characteristics (attributes) that may be inherited from a parent class. * Identify how characters (objects) will interact with each other and their environments through methods. * Read [The Genesis of Wumpus](http://www.atariarchives.org/bcc1/showpage.php?page=247). * Investigate how procedural languages were used. * Establish a quality success criteria for your project. |
| Research and planning  Document using project management tools.  Plan the game you will create. | * Apply appropriate project management tools to develop the project by creating: * a structure chart * data dictionary * a class diagram. |
| Producing and implementing  Develop your game. | * Create the environment (set the scene). * Create the classes and objects. * Create the attributes and methods to move and interact. * Add the characters and their behaviours. * Interact with the characters and environment. * Add items and gameplay. |
| Testing and evaluating  Review and improve your game. | * Apply methodologies to test and evaluate the code including: * unit, subsystem and system testing * black, white and grey box testing * quality assurance. * Analyse and evaluate your solution against the quality success criteria. |

# What is the teacher looking for?

This task will require students to step through activities from the accompanying teacher support resource. This will provide the essential OOP concepts and skills to develop a simple RPG text-based adventure game. Through completing the steps, students begin examining how they will modify the game.

Students research the development of a vintage classic game written using a programming language from the procedural or imperative paradigm and consider how this would be coded in the object-oriented paradigm using Python.

The activities in the teacher support resource culminate in an adventure game loosely based on the vintage classic [Hunt The Wumpus](https://en.wikipedia.org/wiki/Hunt_the_Wumpus).

Students play and analyse the game to identify the control and data structures that could be created using classes, objects, attributes and methods used in interactions.

Students modify the game’s environment, characters, items and gameplay to create their own original take on the project.

# Marking guidelines

Table 2 – assessment marking guidelines

|  |  |
| --- | --- |
| Grade | Marking guideline descriptors |
| A | The student demonstrates extensive knowledge of content and understanding of course concepts and applies highly developed skills and processes in a wide variety of contexts.  In addition, the student demonstrates creative and critical thinking skills using perceptive analysis and evaluation. The student effectively communicates complex ideas and information. |
| B | **The student demonstrates thorough knowledge of content and understanding of course concepts and applies well-developed skills and processes in a variety of contexts.**  **In addition, the student demonstrates creative and critical thinking skills using analysis and evaluation. The student clearly communicates complex ideas and information.** |
| C | The student demonstrates sound knowledge of content and understanding of course concepts and applies skills and processes in a range of familiar contexts.  In addition, the student demonstrates skills in selecting and integrating information and communicates relevant ideas in an appropriate manner. |
| D | **The student demonstrates a basic knowledge of content and understanding of course concepts and applies skills and processes in some familiar contexts.**  **In addition, the student demonstrates skills in selecting and using information and communicates ideas in a descriptive manner.** |
| E | The student demonstrates an elementary knowledge of content and understanding of course concepts and applies some skills and processes with guidance.  In addition, the student demonstrates elementary skills in recounting information and communicating ideas. |

[Common Grade Scale for Preliminary Courses](https://www.educationstandards.nsw.edu.au/wps/portal/nesa/11-12/Understanding-the-curriculum/awarding-grades/monitoring-grades/common-grade-scale/!ut/p/z1/xVPLcoIwFP0WFywzuQkIuMQ-pD6qbaVKNk6MQbESEIK2_fqibWe6Udpx0ezu85yTnGCGp5gpvouXXMep4psqDpk9s-58ABNovzP2bfDaDx2_6wM1LRtPjg3UIzbxLdIbdlwC3nhIbNp16DBoYnaYJ7RDiEsH4FAHvMfR1ejav6XQb37Nw4njwe_mzzSw8_yfMcNMKJ3pFQ6z_UykSkulDcjydC2FRns5N0DJghtACCLUgFItZF5orhaxWiK9kkiUeR6LclMmBvA9z4-FZc4XsjAgSVWs0_xnSqRJlf0MUSH4Rh5YZCJe4JDTCFpgz5HbciSyWlETtWyToqhpujIiwrVd-a36tCx2_lInB7yad6vbEVYcnJMcehae7GK5x4FK86Ry0tMfJfq1CORChJr1zoXru3XWq_5WvN5umVcZ8OC6V42n_-jALAmCIHHNN_QSDW5MK-zu3tv3iIVeo_EBWSUHjA!!/dz/d5/L2dBISEvZ0FBIS9nQSEh/?urile=wcm%3Apath%3A%2Fpw_content%2Fproject-web%2Fnesa%2F11-12%2FUnderstanding-the-curriculum%2Fawarding-grades%2Fmonitoring-grades%2Fcommon-grade-scale)

# Student-facing rubric

Table 3 – rubric for assessment

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Submission criteria | Limited | Basic | Sound | High | Outstanding |
| Workbook activities and challenges  SE-11-01  describes methods used to plan, develop and engineer software solutions | The student has attempted activities from the teacher support resource (TSR). | The student has attempted activities in the TSR to identify features of an OOP program including classes, objects, attributes and methods. | The student has attempted activities in the TSR to correctly identify classes, objects, attributes and methods in an OOP program. | The student completes all activities in the TSR and applies their understanding of classes, objects, attributes and methods to the development of their game. | The student completes all activities in the TSR and applies their understanding of classes, objects, attributes and methods to the development of their game.  The student completes suggested extension activities and widens their exploration and research of the key OOP concepts. |
| Presentation  SE-11-02  explains how structural elements are used to develop programming code | The student’s class presentation attempts an explanation of some of the OOP concepts used in the sample game project. | The student’s class presentation identifies some of the OOP concepts used in the sample game project. | The student’s class presentation outlines the use of the OOP concepts used in the game project. The student is able to answer some of the questions raised during Q&A. | The student describes the use of the OOP concepts and structural elements used in their game project. The student is able to confidently answer questions raised during Q&A about the development process. | The student’s class presentation describes and explains the use of the OOP concepts and structural elements used in their game project. The student provides informative and educative answers to questions raised during Q&A. |
| Computer game  SE-11-08  applies language structures to refine code | The student attempts to modify code for the game with close supervision and direct instruction. | The student copies the code for the sample game with some attempt to modify the code. | The student creates a working RPG text-based adventure game with some variations from the sample provided. | The student creates a working variation of the game with added characters and gameplay that use key OOP concepts, including: objects, classes, encapsulation, abstraction, inheritance, generalisation, polymorphism. | The student creates an outstanding, informative and entertaining RPG based computer game with original characters, environment and gameplay that demonstrates the use and clear understanding of the key OOP concepts. |
| Documentation  SE-11-06  applies tools and resources to design, develop, manage and evaluate software  SE-11-09  manages and documents the development of a software project | The student attempts to create an adventure game with little or no evidence of documentation. | The student attempts to create an adventure game with some internal and intrinsic documentation and a brief journal that documents progress and pitfalls. | The student creates the sample adventure game with internal and intrinsic documentation and a journal that documents progress and pitfalls. | The student creates an adventure game with comprehensive internal and intrinsic documentation and a detailed journal that documents progress and pitfalls. | The student creates an original adventure game with comprehensive internal and intrinsic documentation including credits for publication, as well as a detailed journal that documents progress and pitfalls as well as an evaluation and project proposal for improvements via a sequel. |

# Student support material

Resources include:

* Teacher support resource with scaffolds, templates and graphic organisers for completing the task
* Teacher support resource with additional information to support student understanding
* Program of learning.

# Additional information

This resource has been developed to assist teachers in NSW Department of Education schools to create learning that is contextualised to their classroom. It can be used as a basis for the teacher’s own program, assessment, or scope and sequence, or be used as an example of how the new curriculum could be implemented. The resource should be used with timeframes that are created by the teacher to meet the overall schedules of assessment.

For additional support or advice, contact the TAS curriculum team by emailing [TAS@det.nsw.edu.au](mailto:TAS@det.nsw.edu.au).

## Assessment advice

Assessment is a powerful tool to measure student learning and plan for the next stages in the learning process. Some considerations in using parts of this assessment notification are:

* Consider the skills, knowledge and understanding students need to complete the task, and see where there are opportunities for them to refine these through ongoing feedback in the learning sequences associated with the assessment task.
* Ensure the language and readability of the task presents an appropriate challenge for the students the task is being used with. Direct, plain English will allow the greatest number of students to access the task independently.
* Marking guidelines should directly reflect the success criteria and outcomes of the task and align with appropriate levels of achievement for the relevant Stage.
* When constructing or adjusting the marking guidelines and/or rubric, try to keep active verbs like ‘do’, ‘say’, ‘make’ or ‘write’ in mind to measure student performance at each level. This will help to avoid subjective language.

## Assessment as a learning opportunity

Assessment can provide ways for students to use formal and informal feedback and self-assessment to help them understand where they are in their learning, where they are going, and how they are going to get there. It is essential that students receive feedback on their performance in the task and have opportunity to clarify and plan the next steps in learning.

* Clear and explicit marking rubrics can support effective self-assessment in relation to the learning intentions and success criteria assisting students to become owners of their own learning. Students can then build their capacity for individual goal setting, which includes students asking questions such as, ‘What do I need to improve?’ and ‘What is my next step?’ ([CESE Growth goal setting – what works best in practice](https://education.nsw.gov.au/about-us/educational-data/cese/publications/practical-guides-for-educators/growth-goal-setting)).
* Greater learning gains may be made when teachers provide explicit descriptive feedback to students in a timely manner. This feedback supports students in forming their learning goals as well as helping the teacher to plan for the next iteration of the teaching and learning cycle.

## Differentiation advice

Differentiated learning can be enabled by differentiating the assessment approach to content, process and product. Reasonable adjustments of assessment for students with disability is a legal requirement under the [Disability Standards for Education 2005 (Cth)](https://www.education.gov.au/disability-standards-education-2005). For students with a disability, adjustment in assessment tasks should be made through the [Collaborative curriculum planning](https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/diversity-in-learning/special-education/collaborative-curriculum-planning) process. For more information on differentiation, go to [Differentiating learning](https://education.nsw.gov.au/teaching-and-learning/professional-learning/teacher-quality-and-accreditation/strong-start-great-teachers/refining-practice/differentiating-learning) and [Differentiation](https://education.nsw.gov.au/campaigns/inclusive-practice-hub/primary-school/teaching-strategies/differentiation). When using this resource, teachers can use a range of [adjustments](https://education.nsw.gov.au/teaching-and-learning/disability-learning-and-support/personalised-support-for-learning/adjustments-to-teaching-and-learning) to ensure a personalised approach to student learning.

* Some common adjustments are available through the [inclusive practice hub assessment and reporting](https://education.nsw.gov.au/campaigns/inclusive-practice-hub/all-resources/secondary-resources/other-pdf-resources/nesa-assessment-and-reporting) site.
* The [HPGE Differentiation Adjustment Tool](https://education.nsw.gov.au/teaching-and-learning/high-potential-and-gifted-education/supporting-educators/implement/differentiation-adjustment-strategies) and [Differentiation Package](https://schoolsnsw.sharepoint.com/sites/HPGEHub/SitePages/Home.aspx#first-time-access-to-hpge-resources) can assist teachers to decide how to provide extension and additional challenge for High Potential and Gifted (HPG) students.

The steps below may be useful to consider when creating access opportunities for all students:

* remove unnecessary words/images
* simplify any tricky words, or make a glossary of subject specific words
* reduce the lexical density of the steps and use student friendly language
* chunk large passages of reading or offer alternate ways of representing the information, such as a visual
* make the task description a checklist with numbered steps
* limit options and/or reduce the number of choices students need to make independently.

## Support and alignment

**Resource evaluation and support**: all curriculum resources are prepared through a rigorous process. Resources are periodically reviewed as part of our ongoing evaluation plan to ensure currency, relevance, and effectiveness. For additional support or advice contact the TAS curriculum team by emailing [TAS@det.nsw.edu.au](mailto:TAS@det.nsw.edu.au).

**Alignment to system priorities and/or needs:** [School Excellence Policy](https://education.nsw.gov.au/policy-library/policies/pd-2016-0468), [School Success Model.](https://education.nsw.gov.au/public-schools/school-success-model/school-success-model-explained)

**Alignment to the School Excellence Framework**: this resource supports the [School Excellence Framework](https://education.nsw.gov.au/policy-library/policies/pd-2016-0468) element of assessment (formative assessment, summative assessment, student engagement).

**Alignment to Australian Professional Teaching Standards**: this resource supports teachers to address [Australian Professional Teaching Standards](https://educationstandards.nsw.edu.au/wps/portal/nesa/teacher-accreditation/meeting-requirements/the-standards/proficient-teacher) 5.1.2, 5.4.2.

**Consulted with**: Curriculum and Reform and subject matter experts

**NSW Syllabus**: Software Engineering 11–12

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**Resource**: Assessment task notification

**Related resources**: further resources to support Software Engineering 11–12 can be found on the [TAS curriculum page](https://education.nsw.gov.au/teaching-and-learning/curriculum/tas).

**Professional learning**: relevant professional learning is available through [HSC Professional Learning](https://education.nsw.gov.au/teaching-and-learning/professional-learning/hsc-pl) or on the [TAS curriculum page](https://education.nsw.gov.au/teaching-and-learning/curriculum/tas).

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# Evidence base

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