Digital Solutions subject report

2025 cohort

January 2026

Queensland Government | QCAA Queensland Curriculum & Assessment Authority

260041

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Contents

Introduction

The annual subject reports seek to identify strengths and opportunities for improvement of internal and external assessment processes for all Queensland schools. The 2025 subject report is the culmination of the partnership between schools and the QCAA. It addresses school-based assessment design and judgments, and student responses to external assessment for General and General (Extension) subjects. In acknowledging effective practices and areas for refinement, it offers schools timely and evidence-based guidance to further develop student learning and assessment experiences for 2026.

The report also includes information about:

- how schools have applied syllabus objectives in the design and marking of internal assessments
- how syllabus objectives have been applied in the marking of external assessments
- patterns of student achievement
- important considerations to note related to the revised 2025 syllabus (where relevant).

The report promotes continuous improvement by:

- identifying effective practices in the design and marking of valid, accessible and reliable assessments
- recommending where and how to enhance the design and marking of valid, accessible and reliable assessment instruments
- providing examples that demonstrate best practice.

Schools are encouraged to reflect on the effective practices identified for each assessment, consider the recommendations to strengthen assessment design and explore the authentic student work samples provided.

Audience and use

This report should be read by school leaders, subject leaders, and teachers to:

- inform teaching and learning and assessment preparation
- assist in assessment design practice
- assist in making assessment decisions
- help prepare students for internal and external assessment.

The report is publicly available to promote transparency and accountability. Students, parents, community members and other education stakeholders can use it to learn about the assessment practices and outcomes for senior subjects.

Subject highlights

90.85%
agreement with provisional marks for IA3

97.69%
of students received a C or higher

83.74%
of students completed 4 units

Subject data summary

Unit completion

The following data shows students who completed the General subject.

Note: All data is correct as at January 2026. Where percentages are provided, these are rounded to two decimal places and, therefore, may not add up to 100%.

Number of schools that offered Digital Solutions: 149.

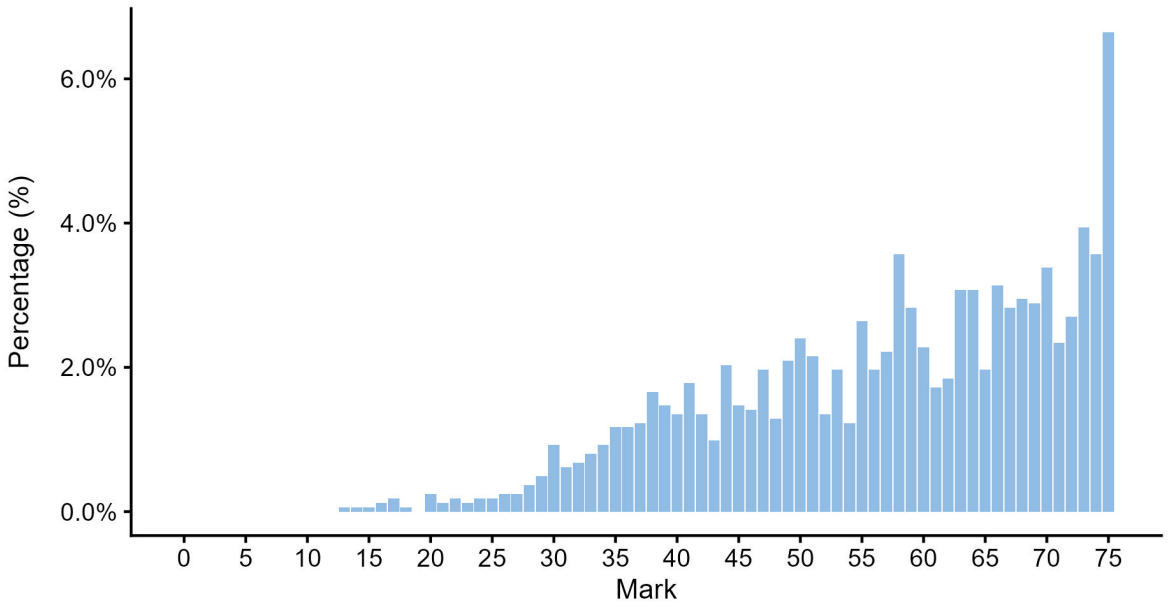
Completion of units	Unit 1	Unit 2	Units 3 and 4
Number of students completed	1,913	1,810	1,602

Units 1 and 2 results

Number of students	Unit 1	Unit 2
Satisfactory	1,797	1,669
Unsatisfactory	116	141

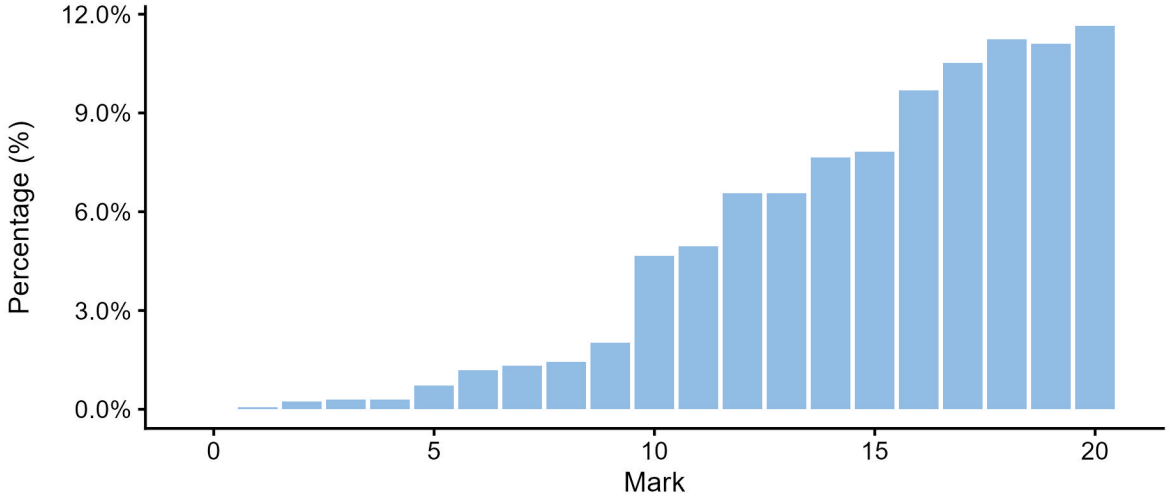
Units 3 and 4 internal assessment (IA) results

Total marks for IA

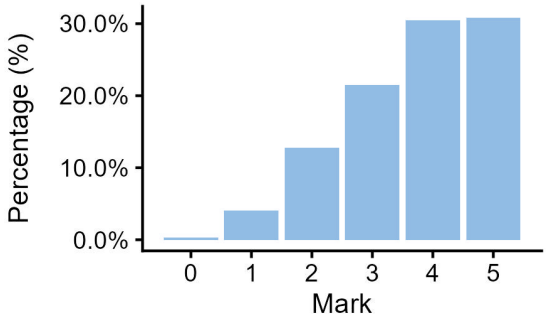


IA1 marks

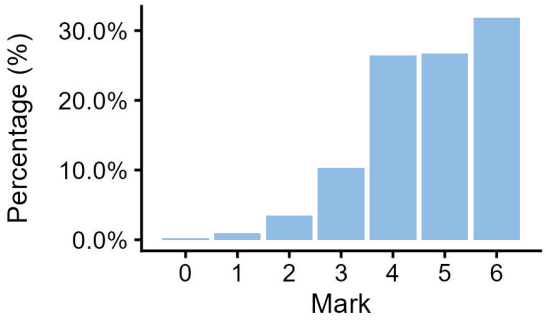
IA1 total



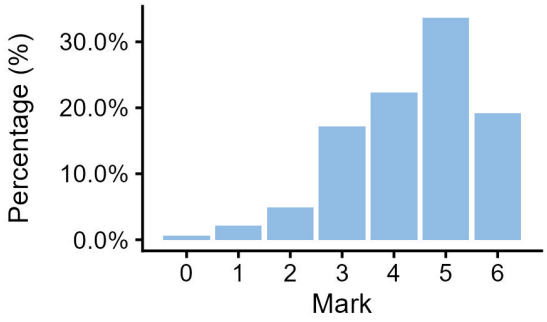
IA1 Criterion: Retrieving and comprehending



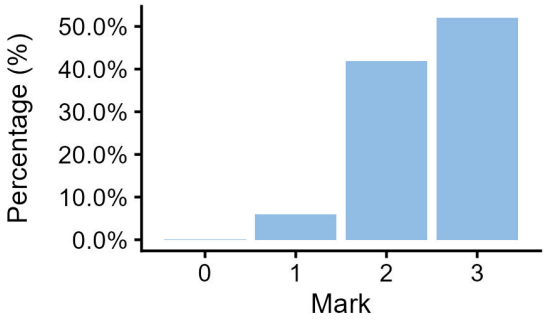
IA1 Criterion: Analysing



IA1 Criterion: Synthesising and evaluating

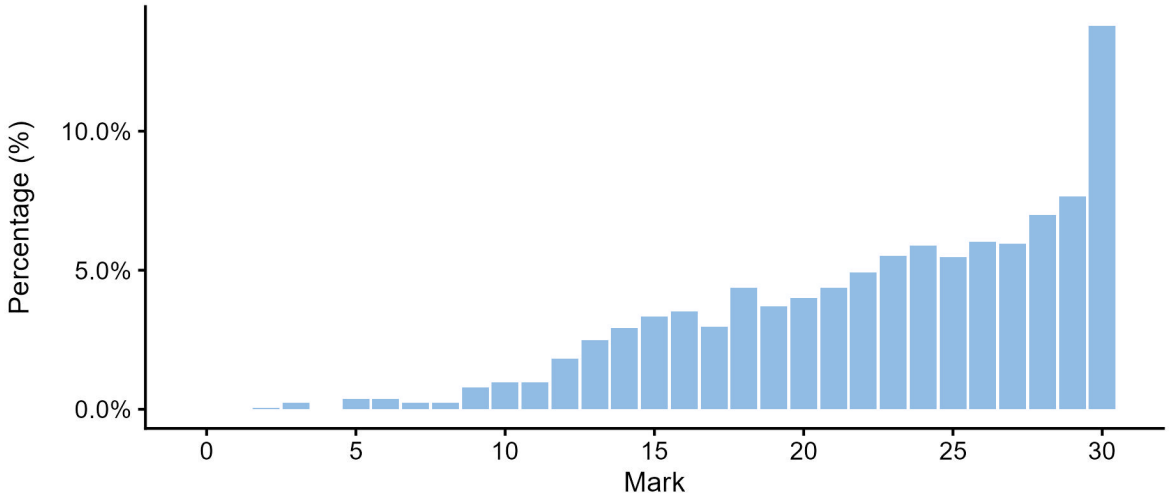


IA1 Criterion: Communicating

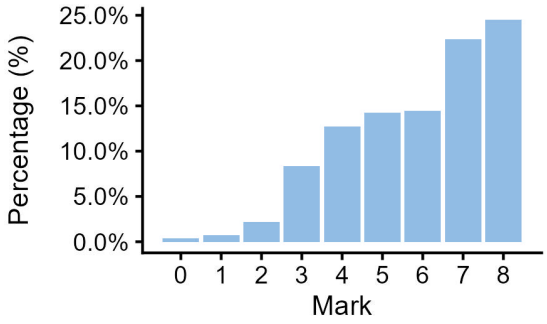


IA2 marks

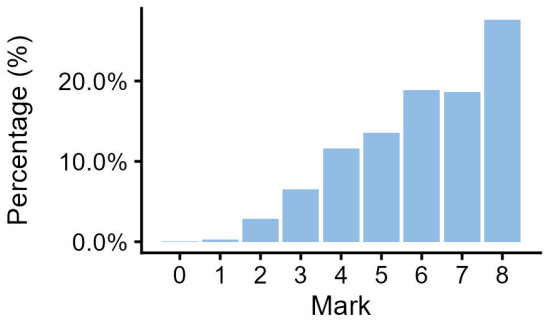
IA2 total



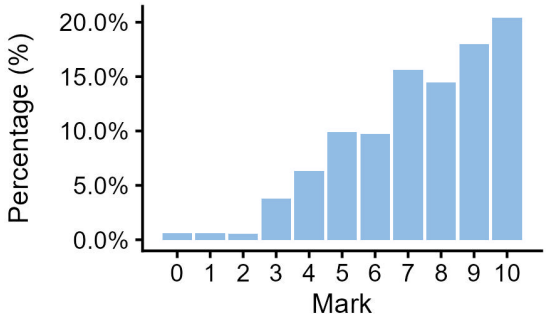
IA2 Criterion: Retrieving and comprehending



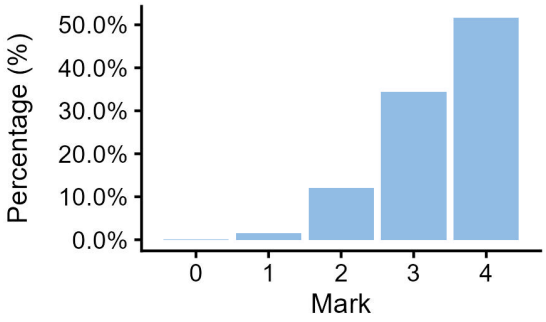
IA2 Criterion: Analysing



IA2 Criterion: Synthesising and evaluating

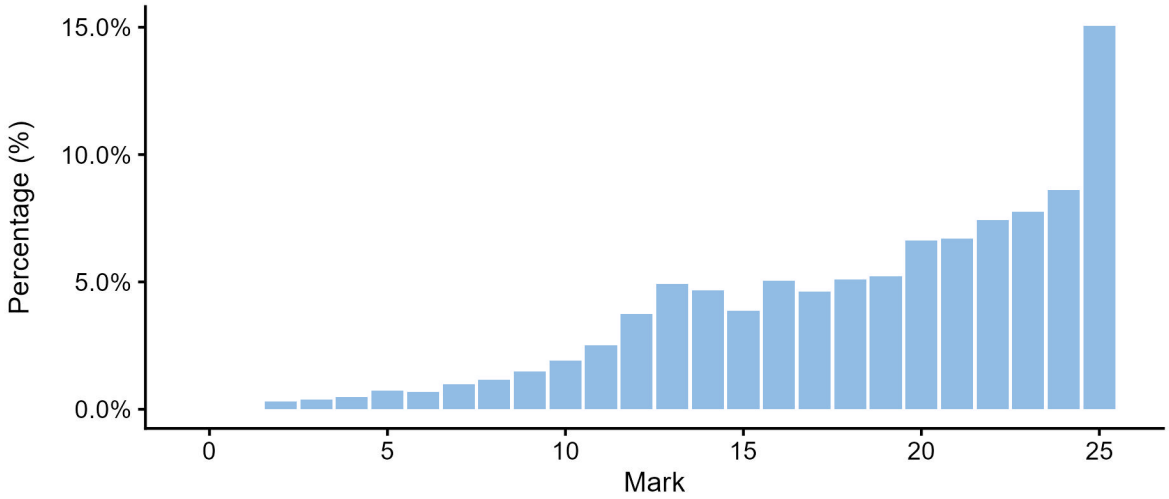


IA2 Criterion: Communicating

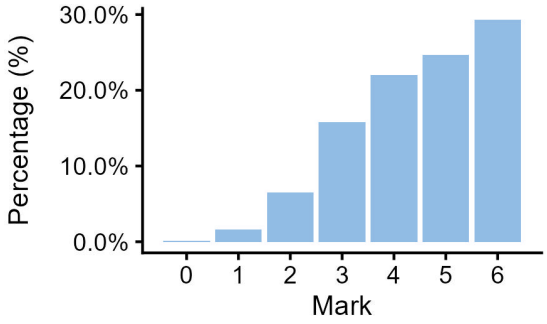


IA3 marks

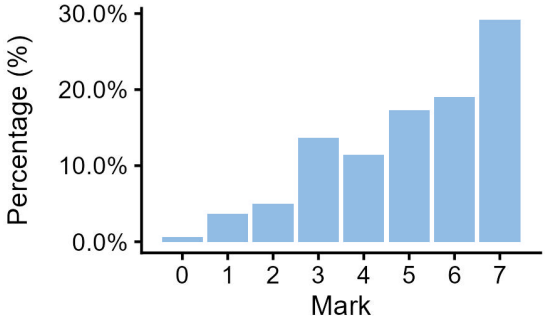
IA3 total



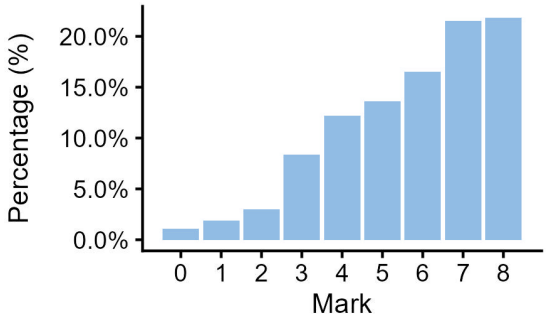
IA3 Criterion: Retrieving and comprehending



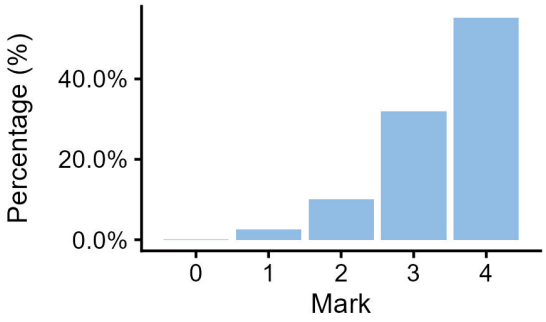
IA3 Criterion: Analysing



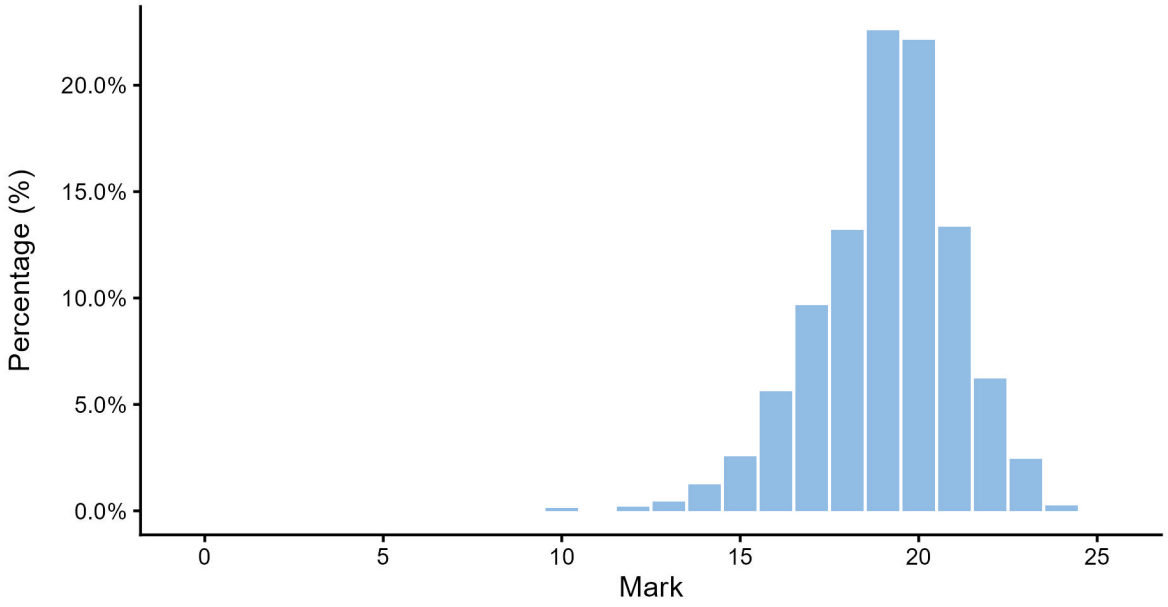
IA3 Criterion: Synthesising and evaluating



IA3 Criterion: Communicating

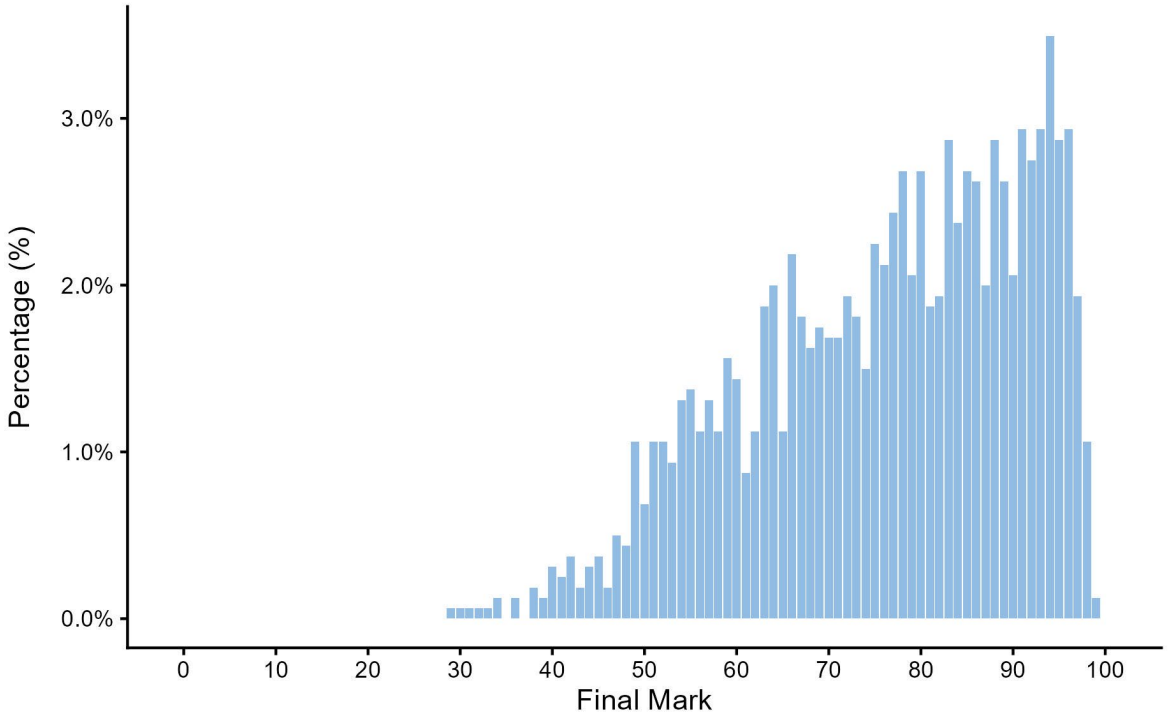


External assessment (EA) marks



Final subject results

Final marks for IA and EA



Grade boundaries

The grade boundaries are determined using a process to compare results on a numeric scale to the reporting standards.

Standard	A	B	C	D	E
Marks achieved	100–85	84–68	67–45	44–19	18–0

Distribution of standards

Number of students who achieved each standard across the state.

Standard	A	B	C	D	E
Number of students	575	565	425	37	0
Percentage of students	35.89	35.27	26.53	2.31	0.00

Internal assessment

This information and advice relate to the assessment design and assessment decisions for each IA in Units 3 and 4. These instruments have undergone quality assurance processes informed by the attributes of quality assessment (validity, accessibility and reliability).

Endorsement

Endorsement is the quality assurance process based on the attributes of validity and accessibility. These attributes are categorised further as priorities for assessment, and each priority can be further broken down into assessment practices.

Data presented in the Assessment design section identifies the reasons why IA instruments were not endorsed at Application 1, by the priority for assessment. An IA may have been identified more than once for a priority for assessment, e.g. it may have demonstrated a misalignment to both the subject matter and the assessment objective/s.

Refer to *QCE and QCIA policy and procedures handbook v7.0*, Section 9.5.

Percentage of instruments endorsed in Application 1

Internal assessment	IA1	IA2	IA3
Number of instruments	148	148	143
Percentage endorsed in Application 1	62	56	17

Confirmation

Confirmation is the quality assurance process based on the attribute of reliability. The QCAA uses provisional criterion marks determined by teachers to identify the samples of student responses that schools are required to submit for confirmation.

Confirmation samples are representative of the school's decisions about the quality of student work in relation to the instrument-specific marking guide (ISMG) and are used to make decisions about the cohort's results.

Refer to *QCE and QCIA policy and procedures handbook v7.0*, Section 9.6.

The following table includes the percentage agreement between the provisional marks and confirmed marks by assessment instrument. The Assessment decisions section for each assessment instrument identifies the agreement trends between provisional and confirmed marks by criterion.

Number of samples reviewed and percentage agreement

IA	Number of schools	Number of samples requested	Number of additional samples requested	Percentage agreement with provisional marks
1	143	881	1	71.33
2	143	882	2	74.83
3	142	873	0	90.85

Internal assessment 1 (IA1)

Investigation — technical proposal (20%)

The IA1 Investigation — technical proposal assessment requires students to research a specific problem through collection, analysis and synthesis of information. A technical proposal uses research or investigative practices to assess a range of cognitions in a particular context. Research or investigative practices include locating and using information beyond students' own knowledge and the data they have been given.

Students must adhere to research conventions, including citations, reference lists or bibliographies. This assessment occurs over an extended and defined period of time. Students may use class time and their own time to develop a proposal and identify a low-fidelity prototype digital solution.

Assessment design

Validity

Validity in assessment design considers the extent to which an assessment item accurately measures what it is intended to measure and that the evidence of student learning collected from an assessment can be legitimately used for the purpose specified in the syllabus.

Reasons for non-endorsement by priority of assessment

Validity priority	Number of times priority was identified in decisions
Alignment	25
Authentication	0
Authenticity	20
Item construction	25
Scope and scale	10

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that:

- featured clearly defined and engaging non-generic contexts to support exploration of relevant subject matter
- used the context to frame the task and support exploration of relevant subject matter
- clearly identified only one draft checkpoint (*QCE and QCIA policy and procedures handbook v7.0,* Section 8.2.5)
- limited scope and scale by including direct links to relevant datasets or specific search terms for a data portal to support insightful analysis.

Practices to strengthen

It is recommended that assessment instruments:

- include accessible datasets by providing working links along with representative screenshots, particularly where sensor data is required. Screenshots of sample data future-proof the

instrument if data sources become unavailable, and enable the validity, scope and scale of stimulus items to be easily determined

- include information in the context, task and stimulus sections that frame the determination of criteria to evaluate the personal, social and economic impacts, and quality, appropriateness and effectiveness of the developed component or solution (Syllabus section 1.2.4)
- make explicit reference to the relevant technology context in the task description from the list of technology contexts outlined in Unit 3 (Syllabus section 4.1).

Accessibility

Accessibility in assessment design ensures that no student or group of students is disadvantaged in their capacity to access an assessment.

Reasons for non-endorsement by priority of assessment

Accessibility priority	Number of times priority was identified in decisions
Bias avoidance	1
Language	0
Layout	4
Transparency	3

Effective practices

Accessibility priorities were effectively demonstrated in assessment instruments that:

- used clear and concise task instructions that reflected syllabus language and avoided unnecessary distractors, e.g. avoided providing additional information that did not contribute to the task
- described contexts that were accessible, relevant and engaging, often linked to local or school-based scenarios
- modelled correct spelling and grammar, particularly for technical terms that could alter the meaning of the instruction if misspelt.

Practices to strengthen

It is recommended that assessment instruments:

- describe contexts that are accessible to students without placing students in professional roles outside the scope of their knowledge and experience
- include the complete list of assessable evidence in the same hierarchical order as the syllabus for clarity, ensuring the bullet points are visible (Syllabus section 4.6.1).

Additional advice

When developing an assessment instrument for this IA, it is essential to consider the following key differences between the 2019 and 2025 syllabuses:

- Objective 7 is no longer assessed. However, assessments must include enough contextual details in the context and stimulus sections for students to consider the personal, social and economic impacts, and quality, appropriateness and effectiveness of the generated component or solution when determining success criteria (2025 syllabus, p. 9).

- The assessment specifications and ISMG now require evidence of possible solutions. Therefore, scaffolding could guide responses about how to present work in progress, e.g. showing planning or a previous iteration of a component with annotations to identify refinements that were made to user interfaces, algorithms and data.
- The response requirements have changed. Scaffolding could
  - guide the use of annotations in various forms (e.g. callouts, labels, and lists) to support effective decision-making about and fluent use of visual and written features within the word limit
  - remind students, if relevant, to change the default document size in presentation software to A4 and avoid developing responses with 16:9 or 4:3 screen ratios, as this does not comply with response requirements.

Assessment decisions

Reliability

Reliability refers to the extent to which the results of assessments are consistent, replicable and free from error.

Agreement trends between provisional and confirmed marks

Criterion number	Criterion name	Percentage agreement with provisional	Percentage less than provisional	Percentage greater than provisional	Percentage both less and greater than provisional
1	Retrieving and comprehending	90.91	9.09	0.00	0.00
2	Analysing	87.41	12.59	0.00	0.00
3	Synthesising and evaluating	78.32	21.68	0.00	0.00
4	Communicating	97.20	2.10	0.70	0.00

Effective practices

Reliable judgments were made using the ISMG for this IA when:

- for the Retrieving and comprehending criterion, there was evidence of
  - accurate recognition and discerning description of relevant data sources, programming elements and useability principles, with clear links to what each was used for and how it supported the identified problem, user needs and solution goals, e.g. identifying a relational dataset and explaining how fields supported the solution purpose, naming a code library, such as one for data handling or interface design, to justify its role in the proposed solution, or describing how error prevention was addressed in the interface design
- for the Analysing criterion, there was evidence of
  - analysis that drew on multiple sources, such as existing solutions, user needs, data characteristics and contextual constraints, rather than relying on a single aspect. This supported the determination of solution requirements and prescribed or self-determined criteria, with responses clearly identifying specific, measurable and context-relevant requirements and criteria tailored to user needs, constraints and system functionality

- for the Synthesising and evaluating criterion, there was evidence of
  - evaluation of impacts, components and low-fidelity prototypes against relevant prescribed and self-determined criteria, with a clear distinction made between statements of opinion and recommendations or refinements substantiated by data. Responses considered the significance of personal, social and economic impacts, assessed components against criteria such as accessibility or consistency, and used evaluation evidence to refine prototype design and make specific, justified recommendations
- for the Communicating criterion, there was evidence of
  - clear, accurate and relevant use of technical language appropriate to a technical audience, demonstrating subject matter knowledge and effective decision-making about language choices.

Practices to strengthen

When making judgments for this IA for the 2025 syllabus, it is essential to consider the following key differences between the ISMGs in the 2019 and 2025 syllabuses:

- The 2025 ISMG criteria have been reconfigured.
  - Comprehending is worth 5 marks as an independent criterion.
  - Analysing is worth 7 marks as an independent criterion.
  - Synthesising is worth 6 marks as an independent criterion.
  - Generating is worth 5 marks as an independent criterion.
  - The Communicating criterion has been reduced to 2 marks with no mark range for the lower performance level.
  - All descriptors have been simplified, with one qualifier and a clear list of characteristic elements.

To further ensure reliable judgments are made using the ISMG for this IA, it is recommended that:

- when matching evidence for the Comprehending criterion
  - ensure high-level responses demonstrate understanding of the distinction between useability, user experience and visual communication. This understanding should be applied accurately, with attention to common misconceptions such as equating safety with security or privacy, and symbolisation should be contextualised to the identified problem rather than generic
  - ensure description of existing solutions makes explicit reference to the relevant application of certain features to the identified real-world problem
- when matching evidence to descriptors for the Analysing criterion
  - accurate judgments will recognise the difference between responses that list solution requirements or criteria and those that analyse their significance in relation to user needs, constraints and solution goals
- when matching evidence to descriptors for the Synthesising criterion
  - accurate judgments will recognise that generated components address the identified problem from the user and developer's perspective. Reliable judgments require recognition of responses where user interface (UI) mock-ups and algorithm proposals integrate UI, logic and data to form a cohesive system proposal that demonstrates how the solution meets user needs and goals while also demonstrating technical functionality

  - ensure effective use of the problem-solving process, particularly the Explore phase, which builds a deep understanding of the problem, requirements and criteria. This provides the foundation for development, ensuring generated components meaningfully use data to solve the identified problem, rather than producing solutions that simply call and display data without addressing the solution purpose

- when matching evidence to descriptors for the Communicating criterion
  - attention should be given to whether a response demonstrates a genuine effort to acknowledge sources and practise ethical scholarship through consistent use of referencing conventions and inclusion of a reference list. Making reliable judgments requires recognising evidence of consistent acknowledgment across a response, even when minor inconsistencies are present.

Additional advice

It is essential to consider the following key differences between the 2019 and 2025 syllabuses:

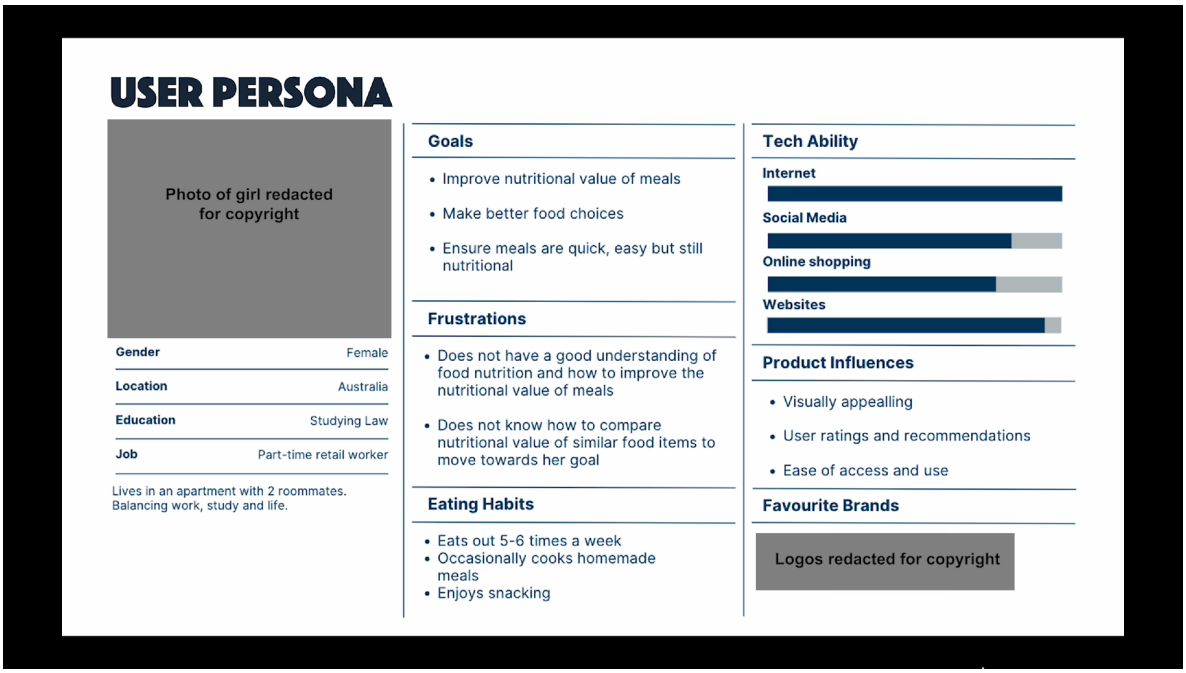
- Objective 7 is no longer assessed. Consider that
  - while responses are not required to evaluate prototype solutions, they are still expected to determine criteria that consider the personal, social and economic impacts, and quality, appropriateness and effectiveness of the generated component or solution (2025 syllabus, p. 9)
  - it may be helpful for success criteria to be coded (e.g. ‘SC1’) and for responses to reference success criteria codes in annotations and other written features to support decision-making throughout a response
  - responses will not include explicit evidence of evaluation against criteria, but effective implementation of the problem-solving process will result in iterative evaluation to refine components during development that will support judgments about the development of possible solutions for components and the presentation of a proposed prototype solution. Teachers should encourage students to use the *Problem-solving process prompts* resource (available in the Resources section of the Syllabuses application (app) in the QCAA Portal) to guide implementation of the process.
- The assessment specifications and ISMG require evidence of possible solutions.
  - Responses must develop possible solutions as opposed to simply identifying them. This shift links directly to the Develop phase of the problem-solving process, where students express algorithms as part of their computational thinking. Pseudocode and other algorithms provide evidence that students have actively shaped solutions.
  - Responses must present work in progress, e.g. evidence of planning or previous iterations of components with annotations or spoken features used to justify possible solutions for user interfaces, algorithms and data. Evidence may also include examples before and after refinements, supported by annotations or spoken features that explain or justify decisions, enabling accurate judgments for possible solutions.
  - Features such as pseudocode, code, models, sketches, diagrams and schemas will enable students to demonstrate ideas for possible solutions for user interfaces, algorithms and data.
- Response requirements now include a 2000-word limit.
  - Pseudocode and other algorithms are expressions of programming logic and are not included in the word count. User interface sketches, wireframes, data flow diagrams and schemas are not included in the word count as they qualify as visual elements associated

with a technical proposal response. Any text in the response that describes, explains or justifies ideas and decisions as a result of the synthesis of information and ideas will contribute to the word count.

Samples

The following excerpt demonstrates insightful analysis of relevant contextual information through user personas to determine solution requirements.

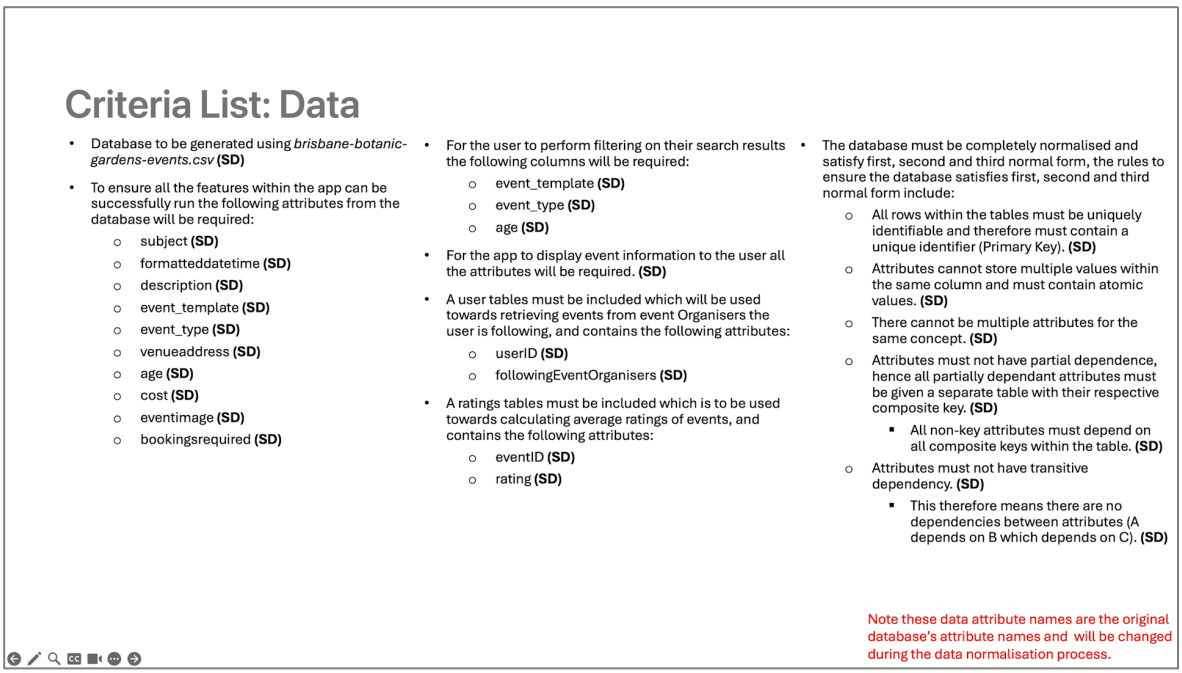
Note: The characteristic/s identified may not be the only time the characteristic/s occurred throughout a response.



Video content: (16 secs)
https://youtu.be/ROjg3095z0Q

The following excerpt demonstrates a discerning description of data sources that shows understanding of relational and flat file data structures appropriate to the problem context.

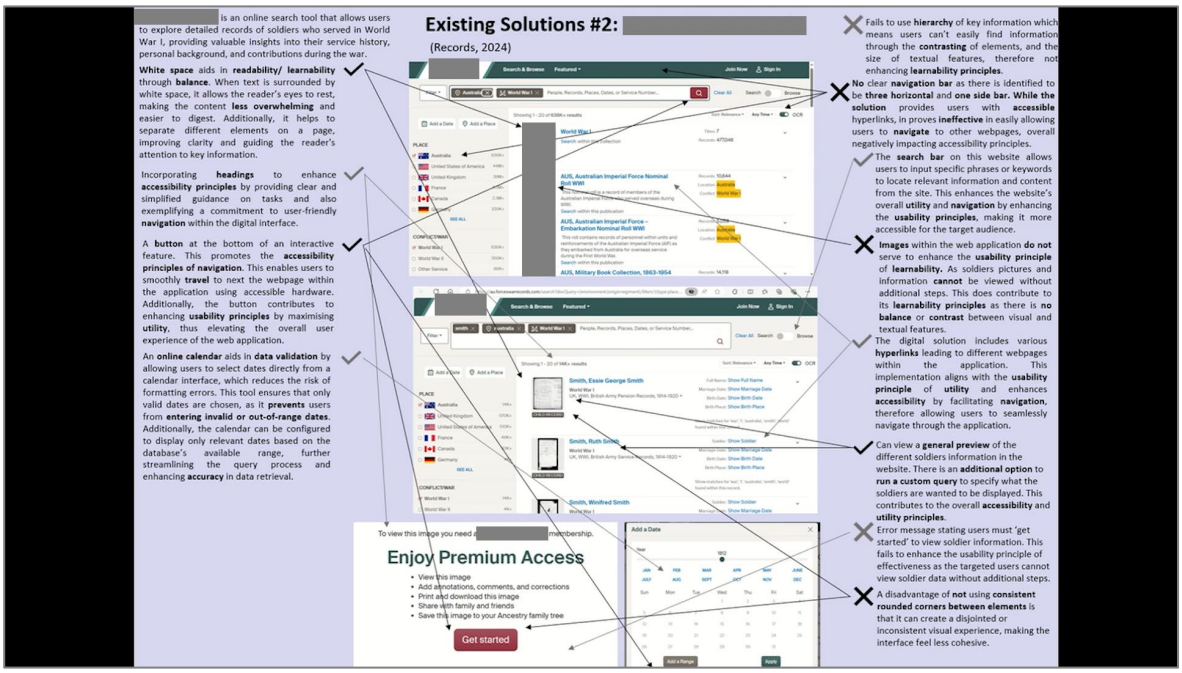
Note: The characteristic/s identified may not be the only time the characteristic/s occurred throughout a response.



Video content: (2 min)
https://youtu.be/_Zpk468VgF4

The following excerpt demonstrates insightful analysis of existing solutions to identify the relevant elements and features of user interface, data and programming components and their relationships to the structure of the identified problem.

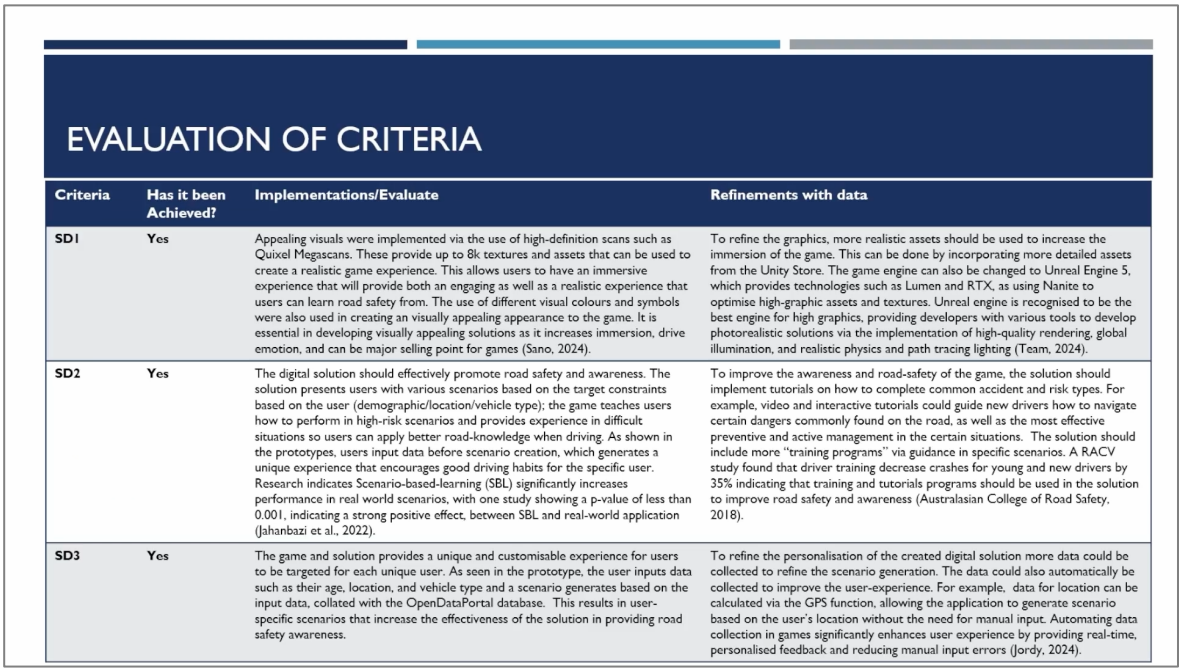
Note: The characteristic/s identified may not be the only time the characteristic/s occurred throughout a response.



Video content: (1 min, 7 secs)
https://youtu.be/-zSEw2WvX2U

The following excerpt demonstrates the use of discerning and fluent communication to identify where and explain why refinements have been made to a component, with clear evidence of testing outcomes to justify recommendations.

Note: The characteristic/s identified may not be the only time the characteristic/s occurred throughout a response.



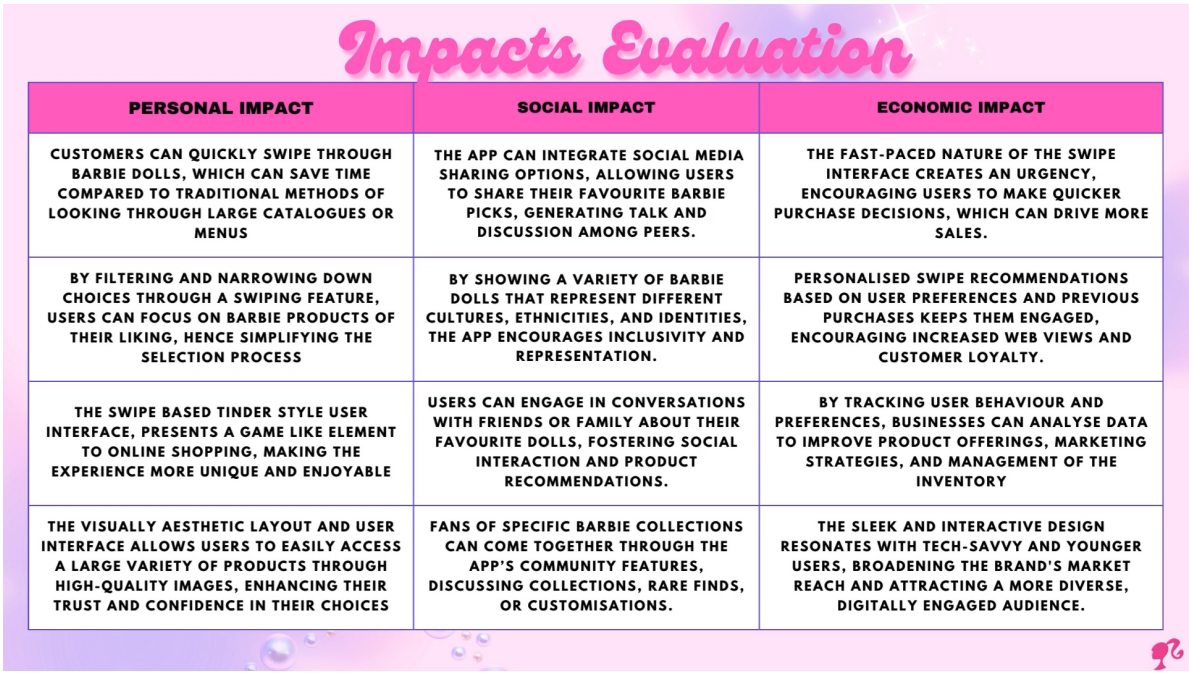
EVALUATION OF CRITERIA

Criteria	Has it been Achieved?	Implementations/Evaluate	Refinements with data
SD1	Yes	Appealing visuals were implemented via the use of high-definition scans such as Quixel Megascans. These provide up to 8k textures and assets that can be used to create a realistic game experience. This allows users to have an immersive experience that will provide both an engaging as well as a realistic experience that users can learn road safety from. The use of different visual colours and symbols were also used in creating an visually appealing appearance to the game. It is essential in developing visually appealing solutions as it increases immersion, drive emotion, and can be major selling point for games (Sano, 2024).	To refine the graphics, more realistic assets should be used to increase the immersion of the game. This can be done by incorporating more detailed assets from the Unity Store. The game engine can also be changed to Unreal Engine 5, which provides technologies such as Lumen and RTX, as using Nanite to optimise high-graphic assets and textures. Unreal engine is recognised to be the best engine for high graphics, providing developers with various tools to develop photorealistic solutions via the implementation of high-quality rendering, global illumination, and realistic physics and path tracing lighting (Team, 2024).
SD2	Yes	The digital solution should effectively promote road safety and awareness. The solution presents users with various scenarios based on the target constraints based on the user (demographic/location/vehicle type); the game teaches users how to perform in high-risk scenarios and provides experience in difficult situations so users can apply better road-knowledge when driving. As shown in the prototypes, users input data before scenario creation, which generates a unique experience that encourages good driving habits for the specific user. Research indicates Scenario-based-learning (SBL) significantly increases performance in real world scenarios, with one study showing a p-value of less than 0.001, indicating a strong positive effect, between SBL and real-world application (Jahanbazi et al., 2022).	To improve the awareness and road-safety of the game, the solution should implement tutorials on how to complete common accident and risk types. For example, video and interactive tutorials could guide new drivers how to navigate certain dangers commonly found on the road, as well as the most effective preventive and active management in the certain situations. The solution should include more "training programs" via guidance in specific scenarios. A RACV study found that driver training decrease crashes for young and new drivers by 35% indicating that training and tutorials programs should be used in the solution to improve road safety and awareness (Australasian College of Road Safety, 2018).
SD3	Yes	The game and solution provides a unique and customisable experience for users to be targeted for each unique user. As seen in the prototype, the user inputs data such as their age, location, and vehicle type and a scenario generates based on the input data, collated with the OpenDataPortal database. This results in user-specific scenarios that increase the effectiveness of the solution in providing road safety awareness.	To refine the personalisation of the created digital solution more data could be collected to refine the scenario generation. The data could also automatically be collected to improve the user-experience. For example, data for location can be calculated via the GPS function, allowing the application to generate scenario based on the user's location without the need for manual input. Automating data collection in games significantly enhances user experience by providing real-time, personalised feedback and reducing manual input errors (Jordy, 2024).

Video content: (1 min, 11 secs)
https://youtu.be/uaptcw9ZFBY

The following excerpt demonstrates critical evaluation of personal, social and economic impacts against effective prescribed and self-determined criteria.

Note: The characteristic/s identified may not be the only time the characteristic/s occurred throughout a response.



Impacts Evaluation

PERSONAL IMPACT	SOCIAL IMPACT	ECONOMIC IMPACT
CUSTOMERS CAN QUICKLY SWIPE THROUGH BARBIE DOLLS, WHICH CAN SAVE TIME COMPARED TO TRADITIONAL METHODS OF LOOKING THROUGH LARGE CATALOGUES OR MENUS	THE APP CAN INTEGRATE SOCIAL MEDIA SHARING OPTIONS, ALLOWING USERS TO SHARE THEIR FAVOURITE BARBIE PICKS, GENERATING TALK AND DISCUSSION AMONG PEERS.	THE FAST-PACED NATURE OF THE SWIPE INTERFACE CREATES AN URGENCY, ENCOURAGING USERS TO MAKE QUICKER PURCHASE DECISIONS, WHICH CAN DRIVE MORE SALES.
BY FILTERING AND NARROWING DOWN CHOICES THROUGH A SWIPING FEATURE, USERS CAN FOCUS ON BARBIE PRODUCTS OF THEIR LIKING, HENCE SIMPLIFYING THE SELECTION PROCESS	BY SHOWING A VARIETY OF BARBIE DOLLS THAT REPRESENT DIFFERENT CULTURES, ETHNICITIES, AND IDENTITIES, THE APP ENCOURAGES INCLUSIVITY AND REPRESENTATION.	PERSONALISED SWIPE RECOMMENDATIONS BASED ON USER PREFERENCES AND PREVIOUS PURCHASES KEEPS THEM ENGAGED, ENCOURAGING INCREASED WEB VIEWS AND CUSTOMER LOYALTY.
THE SWIPE BASED TINDER STYLE USER INTERFACE, PRESENTS A GAME LIKE ELEMENT TO ONLINE SHOPPING, MAKING THE EXPERIENCE MORE UNIQUE AND ENJOYABLE	USERS CAN ENGAGE IN CONVERSATIONS WITH FRIENDS OR FAMILY ABOUT THEIR FAVOURITE DOLLS, FOSTERING SOCIAL INTERACTION AND PRODUCT RECOMMENDATIONS.	BY TRACKING USER BEHAVIOUR AND PREFERENCES, BUSINESSES CAN ANALYSE DATA TO IMPROVE PRODUCT OFFERINGS, MARKETING STRATEGIES, AND MANAGEMENT OF THE INVENTORY
THE VISUALLY AESTHETIC LAYOUT AND USER INTERFACE ALLOWS USERS TO EASILY ACCESS A LARGE VARIETY OF PRODUCTS THROUGH HIGH-QUALITY IMAGES, ENHANCING THEIR TRUST AND CONFIDENCE IN THEIR CHOICES	FANS OF SPECIFIC BARBIE COLLECTIONS CAN COME TOGETHER THROUGH THE APP'S COMMUNITY FEATURES, DISCUSSING COLLECTIONS, RARE FINDS, OR CUSTOMISATIONS.	THE SLEEK AND INTERACTIVE DESIGN RESONATES WITH TECH-SAVVY AND YOUNGER USERS, BROADENING THE BRAND'S MARKET REACH AND ATTRACTING A MORE DIVERSE, DIGITALLY ENGAGED AUDIENCE.

Video content: (50 secs)
https://youtu.be/2IQXeyJxTZg

Internal assessment 2 (IA2)

Project — digital solution (30%)

The IA2 Project — digital solution assessment focuses on the problem-solving process in Digital Solutions that requires the application of a range of cognitive, technical and creative skills and theoretical understandings. The response is a coherent work that documents the iterative process undertaken to develop a solution to a technical proposal. It may include written paragraphs and annotations, diagrams, sketches, drawings, and components of a prototype digital solution.

This assessment occurs over an extended and defined period of time. Students may use class time and their own time to develop a response.

Assessment design

Validity

Validity in assessment design considers the extent to which an assessment item accurately measures what it is intended to measure and that the evidence of student learning collected from an assessment can be legitimately used for the purpose specified in the syllabus.

Reasons for non-endorsement by priority of assessment

Validity priority	Number of times priority was identified in decisions
Alignment	48
Authentication	0
Authenticity	11
Item construction	31
Scope and scale	3

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that:

- explicitly stated the same Unit 3 technology context as the IA1 instrument
- provided data specifications for specific external datasets in CSV format to align with Unit 3 subject matter (Syllabus section 4.4)
- included a list of resources appropriate to the selected technology context, e.g. programming tools, Internet of Things (IoT) or robotic sensors, and accessible open-source software with hyperlinks where appropriate
- described a digital problem that was sufficiently different from the problem explored in IA1, addressing different needs and requiring unique interactions and component specifications to provide adequate opportunity for unique responses.

Practices to strengthen

It is recommended that assessment instruments:

- provide working hyperlinks and high-quality samples of structured internal and external data in CSV format to allow opportunity to explain internal and external data components (Syllabus section 4.6.2)
- include a separate PDF stimulus document as an attachment with headings and content aligned with the syllabus (Syllabus section 4.6.2)
- clearly prescribe criteria in the task description or stimulus document without directing students to a predetermined response to support the determination of criteria that are problem-based rather than task-based
- include a complete list of assessable evidence that reflects the syllabus order and intent (Syllabus section 4.6.2). Rewording is acceptable for clarity, but the meaning and emphasis must remain consistent, i.e. it should be clear what must be symbolised and how.

Accessibility

Accessibility in assessment design ensures that no student or group of students is disadvantaged in their capacity to access an assessment.

Reasons for non-endorsement by priority of assessment

Accessibility priority	Number of times priority was identified in decisions
Bias avoidance	0
Language	1
Layout	6
Transparency	1

Effective practices

Accessibility priorities were effectively demonstrated in assessment instruments that:

- avoided the use of jargon and colloquial language
- provided clear and unambiguous instructions, e.g. explicit information to identify how responses will access data, especially locally generated or sensor data
- included a stimulus with minimal distractors, e.g. avoided using decorative features, or additional or duplicate headings
- described accessible end-user profiles free from bias that clearly articulated the needs and wants of the intended user category.

Practices to strengthen

It is recommended that assessment instruments:

- provide pre-converted datasets that are in other formats (e.g. XLSX, JSON or XML) as this is outside the scope and scale of knowledge and skills that students are required to demonstrate
- include screenshots of data that has been converted from other formats to CSV format.

Additional advice

When developing an assessment instrument for this IA, it is essential to consider the following key differences between the 2019 and 2025 syllabuses:

- Objectives 1, 2 and 3 are no longer assessed. Therefore, consider that
  - students will not document all evidence related to the Explore phase. However, all phases of the problem-solving process apply, and scaffolding should guide responses accordingly
  - instruments must include enough details in the context section and stimulus for students to consider the personal, social and economic impacts, and quality, appropriateness and effectiveness of the generated component or solution when determining success criteria (2025 syllabus, p. 9).
- The assessment specifications and ISMG require evidence of possible solutions, testing and feedback. Therefore, consider that
  - scaffolding could guide responses about how to present work in progress, e.g. showing planning or a previous iteration of a component with annotations to identify refinements that were made to user interfaces, data and programmed components
  - contextual details in the stimulus must allow students to determine specific, measurable success criteria related to impacts and overall solution quality, appropriateness and effectiveness.
- The stimulus is no longer called a technical proposal and requires different information from that of the 2019 syllabus. Ensure that
  - the stimulus is labelled appropriately
  - the stimulus provides broad contextual details, appropriately categorised as functional and non-functional, avoiding lists of specific features that limit the opportunity for unique responses
  - proto-personas or user profiles support students to determine success criteria and synthesise possible solutions for data, user interfaces and programmed components
  - information about data and data repositories provides access to data sets in CSV format, including whether this access is via API, with overarching requirements regarding the storage of data, if relevant.
- The response requirements have changed and the Scaffolding section could
  - guide the use of annotations in various forms (e.g. callouts, labels, and lists) to support effective decision-making about and fluent use of visual and written features within the word limit
  - guide the appropriate use of font sizes that are legible without the need to zoom in on a response
  - reiterate the purpose of the two-minute video, emphasising the quality, appropriateness and effectiveness of the combined solution, as opposed to demonstrating individual front- and back-end components
  - remind students, if relevant, to change the default document size in presentation software to A4 and avoid developing responses with 16:9 or 4:3 screen ratios, as this does not comply with response requirements.
- guide the appropriate use of appendixes, e.g. to include testing and feedback survey data.

Assessment decisions

Reliability

Reliability refers to the extent to which the results of assessments are consistent, replicable and free from error.

Agreement trends between provisional and confirmed marks

Criterion number	Criterion name	Percentage agreement with provisional	Percentage less than provisional	Percentage greater than provisional	Percentage both less and greater than provisional
1	Retrieving and comprehending	88.81	11.19	0.00	0.00
2	Analysing	86.71	13.29	0.00	0.00
3	Synthesising and evaluating	83.92	16.08	0.00	0.00
4	Communicating	97.20	2.10	0.70	0.00

Effective practices

Reliable judgments were made using the ISMG for this IA when:

- in the Retrieving and comprehending criterion, the evidence matched to the upper performance level demonstrated
  - skilled symbolisation of algorithms with pseudocode that was structured and focused on problem-specific components, with fluent use of annotations to explain interrelationships between user experiences and data
- in the Analysing criterion, the evidence matched to the upper performance level demonstrated
  - essential elements and features of data and programmed components specific to the identified problem, with astute determination of user interface requirements supported by contextual understanding of user needs
- in the Synthesising and evaluating criterion, the evidence matched to the upper performance level demonstrated
  - use of the prescribed and self-determined criteria to measure the personal, social and economic impacts, and quality, appropriateness and effectiveness of the developed solution, with refinements and recommendations that were clearly justified by user feedback and testing data for specific features
- in the Communicating criterion, the evidence matched to the upper performance level demonstrated
  - discerning decision-making about, and fluent use of, written features, language, referencing and project conventions, through consistent use of clear, technical language, acknowledgment of third-party sources and a well-organised multimodal document that was labelled, easy to follow and did not exceed the response length conditions.

Practices to strengthen

When making judgments for this IA for the 2025 syllabus, it is essential to consider the following key differences between the ISMGs in the 2019 and 2025 syllabuses:

- The 2025 ISMG criteria have been reconfigured.
  - Determining is paired with Synthesising for 7 marks.
  - Generating is worth 9 marks as an independent criterion.
  - Evaluating is worth 7 marks as an independent criterion.
  - The Communicating criterion has been reduced to 2 marks with no mark range for the lower performance level.
  - All descriptors have been simplified, with one qualifier and a clear list of characteristic elements.

To further ensure reliable judgments are made using the ISMG for this IA, it is recommended that:

- when matching evidence to descriptors for the Determining and synthesising criterion
  - ensure astutely determined success criteria reflect effective implementation of the problem-solving process by including measures that authentically capture the personal, social and economic impacts, and quality, appropriateness and effectiveness of the generated component or solution (2025 syllabus, p. 9), with explicit consideration of user experience, programmed components and impacts
  - ensure success criteria for the quality and effectiveness of programmed components include the accuracy and maintainability of code
  - ensure synthesis of information and ideas is recognised as comprising multiple distinct components that together contribute to the overall quality of the synthesis used to develop possible solutions, with each element informing and strengthening the others to demonstrate systems thinking
- when matching evidence to descriptors for the Evaluating criterion
  - attention be given to distinguishing between critical evaluation, which not only considers user experience and programmed components individually but analyses how these elements interact to address the identified problem in relation to the determined success criteria, and feasible evaluation, which considers the same elements but with less depth, integration or focus on the relationships between user experience and programmed components
- when matching evidence to descriptors for the Generating criterion
  - ensure the video demonstrates how effectively the user interface, data and programmed components have been combined to generate a solution that meets the determined success criteria and addresses the identified real-world problem. Its focus should be on showing how well the solution functions, meets user needs and solves the problem, not merely proving that components have been combined
  - verifying that the prototype includes programmed components that can be supported through checkpoints and authentication measures, e.g. requiring submission of the solution code as an appendix. Response authentication remains a school responsibility
  - user interface sketches, mock-ups, pseudocode and other communication features in the A4 multimodal document contribute to judgments about the synthesis of information and ideas to develop possible solutions for components, as the document format provides

insufficient scope to prove that components have been authentically combined into a working prototype

- when matching evidence to descriptors for the Communicating criterion
  - assessment decisions continue to recognise that effective decision-making and fluent use is about clarity, consistency and ethical scholarship
  - recognise that minor errors in a response do not equate to simple decisions. Simple decision-making includes responses that are disorganised, difficult to follow, contain frequent use of non-technical language and consistently neglect to acknowledge third-party sources
  - effective use of visual, written and spoken features will result in responses that do not exceed response length requirements.

Additional advice

It is essential to consider the following key differences between the 2019 and 2025 syllabuses:

- Note that in the 2025 syllabus the response is a digital solution and there are changes to response requirements regarding word count, page format, page count, video length and the emphasis on the use of annotations to communicate about a solution. Multimodal documents must be in A4 format and contain an effective combination of visual and written features, primarily through the use of annotations, e.g. notes, lists, side notes, callouts.
- Assessment objectives 1, 2 and 3 are no longer assessed in the 2025 syllabus and
  - students are not required to document all evidence related to the Explore phase. However, all phases of the problem-solving process apply. Teachers should encourage students to use the *Problem-solving process prompts* resource (available in the Resources section of the Syllabuses app in the QCAA Portal) to guide implementation of the process
  - while students no longer need to include evidence of analysis in their response, they must determine success criteria. To support judgments, students should provide a brief justification or annotations explaining how each criterion enables authentic and meaningful evaluation of components and the solution. This also supports effective decision-making about the use of written features to communicate about a solution.
- The teacher-provided stimulus is no longer a technical proposal, and the revised stimulus must include specific information about functional and non-functional requirements, end-user profiles or proto-personas and data.
- The assessment specifications and ISMG require evaluation of user experience and programmed components against success criteria as well as evaluation of impacts, so
  - it may be helpful to code success criteria accordingly (e.g. ‘UX1’ for a user experience criterion and ‘PC1’ for a programmed component criterion) and for responses to reference success criteria codes in annotations and other written features to support decision-making throughout a response
  - while impacts are not evaluated against criteria, some success criteria may relate to personal, social or economic impacts and enable authentic evaluation of measurable impacts within the assessment context. It may be helpful to code criteria accordingly, e.g. ‘UX1’, ‘PI1’ for a criterion that relates to user experience and a personal impact. Critical evaluation will also be supported by acknowledging desired or potential impacts that cannot be measured due to constraints or limitations.
- The assessment specifications and ISMG require evidence of refinements and recommendations that are justified by user feedback and testing so refinements and

recommendations should be explicitly linked to the outcomes of user testing and feedback. The success criteria should guide what is tested and evaluated, ensuring that refinements and recommendations are clearly aligned to the criteria and supported by evidence from the testing process. The more specific, measurable and relevant the success criteria, the more targeted the testing and the more meaningful the resulting refinements and recommendations.

- The assessment specifications and ISMG require evidence of the development of possible solutions. Responses must present work in progress, e.g. showing planning or a previous iteration of a component with annotations to identify possible solutions for user interfaces, data and programmed components.

Samples

The following excerpt has been included to show how recognising constraints can support the determination of success criteria. While responses are not expected to provide an exhaustive list of constraints, students may use annotations to acknowledge key limitations. Under the 2025 syllabus response requirements, if students explore all possible constraints, it may be helpful to include an exhaustive list in an appendix while identifying key limitations through annotations in the body of the response. By identifying relevant constraints, students justify their decision-making and strengthen the basis for astutely determined success criteria.

Note: The characteristic/s identified may not be the only time the characteristic/s occurred throughout a response.

1.4.3 Constraints

- Developer Constraints:
  - The developer may not be supplied with the resources needed to construct and program the website.
  - The developer may be limited by the workflow and required criteria.
  - The developer may not possess the creative and software skills required to effectively develop the website's user interface and functionality.
  - The developer may be limited by the 8-week time frame.
- User Constraints:
  - The solution may be limited by the user's wants and needs such as the style guide as this must be considered to appeal to the demographic
  - The solution may be limited by the types of browsers and the skills of users as this will impact the development of the website's layout, learnability and accessibility
- Client Constraints:
  - The needs and wants of the client of [redacted] will influence the functionality, layout and visual appearance of the web application
- Task Guideline Constraints:
  - The web application may be limited by the outlined restrictions, requirements and resources
- Proposed Solution Constraints:
  - The proposed solution does not include payment details such as from a credit card
  - The proposed solution only includes eight items on the menu as it is a prototype
  - The proposed solution only analyses the user interface principles (useability principles, elements and principles of visual communication) for one page as all pages are the designed the same according to the style guide
  - The proposed solution does not display the tables on the user interface designs as all tables can be created in the DB Browser database
  - The parent must know the daughter's user_id
  - The web application may be limited by the outlined restrictions, requirements and resources
- Proposed Solution Constraints:
  - The proposed solution does not include payment details such as from a credit card
  - The proposed solution only includes eight items on the menu as it is a prototype
  - The proposed solution only analyses the user interface principles (useability principles, elements and principles of visual communication) for one page as all pages are the designed the same according to the style guide
  - The proposed solution does not display the tables on the user interface designs as all tables can be created in the DB Browser database
  - The parent must know the daughter's user_id

The following excerpts have been included to show how responses could demonstrate the possible solutions for user interfaces, data and data repositories and programmed components.

In Excerpt 1, the student has included a problem-specific code snippet with an annotation to link explicitly to the determined success criteria.

In Excerpt 2, the student has included pseudocode for a programmed component that solves a user-specific problem.

In Excerpt 3, the student has included a user-interface mock-up with annotations to explain the relevance and appropriateness of design decisions. While responses may acknowledge the need for generic features such as account authentication and database connection, high-level responses such as this will focus on problem-specific features and decisions to demonstrate the use of systems and design thinking to develop ideas about components that best meet the criteria for success.

Note: The characteristic/s identified may not be the only time the characteristic/s occurred throughout a response.

Excerpt 1

```
<form method="POST" action="" enctype="multipart/form-data">
    <!-- Form for uploading an image -->
    {{ form.hidden_tag() }}
    <!-- Hidden CSRF token for security -->
    <fieldset class="form-group">
        <!-- Grouping form fields -->
        <div class="form-group">
            {{ form.image.label() }}
            <!-- Label for the image upload field -->
            {{ form.image(class="form-control-file") }}
            <!-- Image upload input field -->
            {% if form.image.errors %}
                <!-- Check for errors in the image field -->
                {% for error in form.image.errors %}
                    <span class="text-danger">{{ error }}</span>
                    <!-- Display errors in red text -->
                {% endfor %}
            {% endif %}
        </div>
        <div class="form-group">
            {{ form.submit(class="btn btn-outline-info") }}
            <!-- Submit button for the form -->
        </div>
    </fieldset>
</form>
```

If the user has completed the project and intends to upload the image of their finished product, this form allows them to upload their photo. (PC5)

Excerpt 2

Show Preferred Bus Stops and Buses

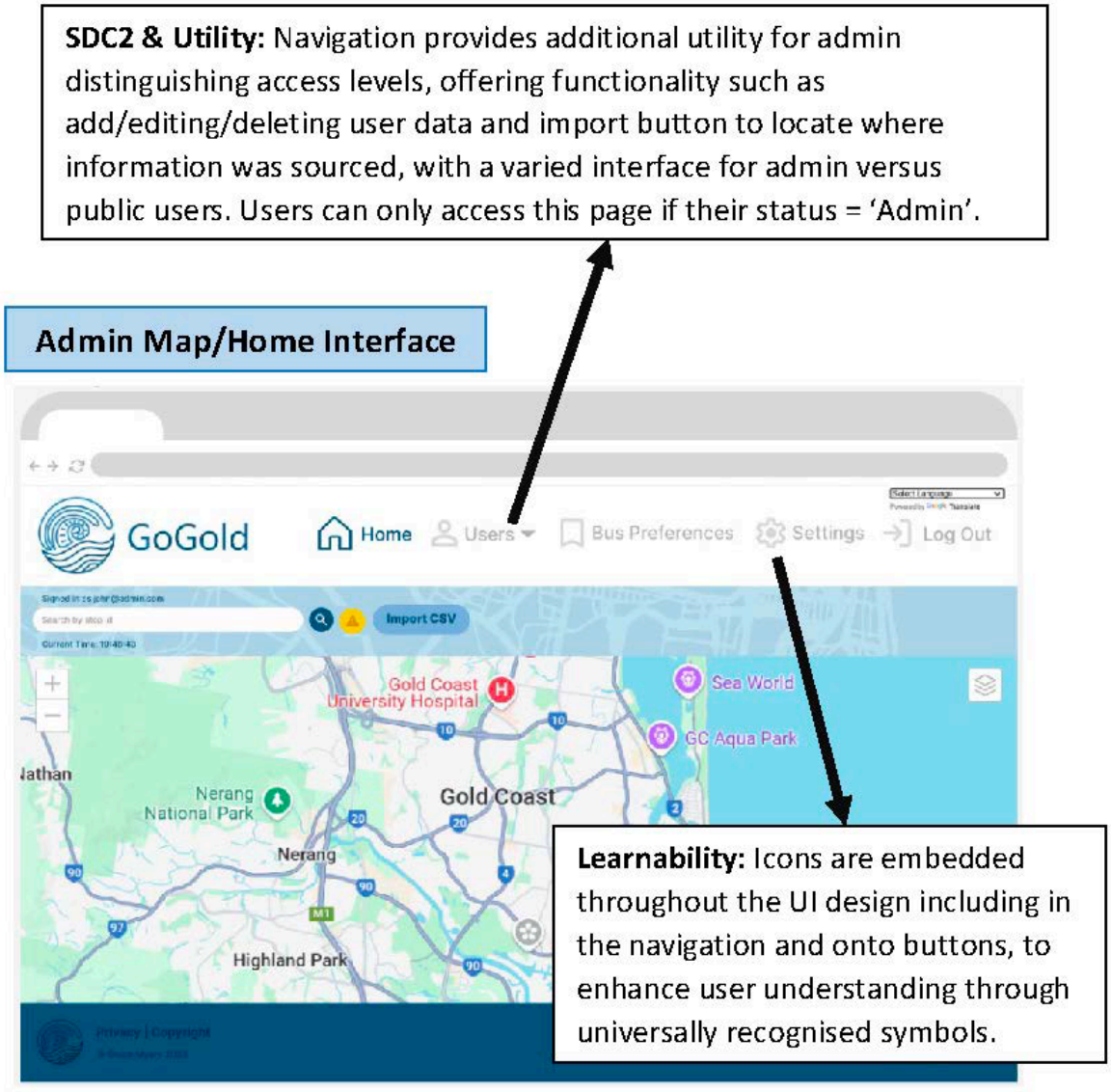
```
Algorithm - Show Preferred Bus Stops and Buses
BEGIN
        CONNECT to DB IA2
        SET SESSION[status]
        FUNCTION retrievePrefStops()

        IF SESSION[Status] = True THEN
                OUTPUT "Logged in as SESSION['username'] "
                SET sqlQuery = "SELECT stop_id FROM users WHERE username = %s"
                SET stops = DB EXECUTE (sqlQuery, SESSION['username'])
        IF affectedRows = 1 THEN
                SET nominatedStop = stops['stop_id']
        ELSE
                SET nominatedStop = "A stop has not been set yet"
        END IF

                OUTPUT "Preferred Stop: nominatedStop "

                SET sqlQuery = "SELECT busID FROM buses WHERE username = %s"
                SET buses = DB EXECUTE (sqlQuery, SESSION['username'])
                OUTPUT "Current preferred buses:"
                FOR EACH buses AS bus
                        SET busID = bus['busID']
                        OUTPUT button busID
                END FOR
        ELSE
                OUTPUT "Not logged in. No preferences available."
        END IF
        END FUNCTION
END
```

Excerpt 3



The following excerpt has been included to show how a table may be used to present possible solutions for data components in a clear and structured manner. Under the revised 2025 Digital Solutions syllabus response requirements, the accompanying written response could be streamlined into a succinct list of key ideas, with the table used to communicate specific decisions. Colour-coding, as shown, provides a visual cue to highlight outcomes and the rationale behind each decision.

Note: The characteristic/s identified may not be the only time the characteristic/s occurred throughout a response.

Data

The dataset from the Queensland state library catalogue consists of a large number of images of the historical happenings of Queensland. When these images are out of copyright which is 70 years after the creator has died or have made the image public (How long does copyright last?, 2025), they are then made available to the public under the creative commons license 4.0, allowing their use with appropriate credit. The data comes in a 7Mb file with 52,000 records called "NASLA_non_ATSI_copyright_expired.csv", this suggests that the data is don't contain any Aboriginal and Torres Strait Islander due to how they could be portrayed. However, there is other options to download the data such as TSV (tab separated values), and a Live API with Json and XML. The TSV file format is similar to the CSV file format but is faster than CSV, however, is hard to work with due to the tabs (Degenhardt, 2021). The TSV file it also comes with an id number which could complicate things when ingesting data from other datasets. The Live AP is unnecessary in this because the dataset was last updated August 2019, and it would add additional http requests every time a user access the web application slowing downloading times dramatically. So, for web application I will use the CSV file for ingestion.

Column Name	Justification
Title	Used to display the name of the picture and searching.
Alternative Terms	Only 135 entries with data included in the description.
Creator	To display who took the picture.
Subject	Not needed for the user's experience but could be used for search terms.
Description	A brief summary of the picture for a better understanding.
Publisher	All from the state Library.
Contributor	Unnecessary data.
Type	All the same type "Image".
Format	All but 25 are jpeg's and the other are copy prints.
Identifier Number	Can not be used due to null values.
Source	All photos are owned by the state library.
Language	All are in Australia meaning they are all in English.
Terms is part of	Contains information for what collection the picture is from.
Spatial Terms	Contains the locations of the photo.
Temporal Terms	Random and unusable data.
Rights	All rights are the same and is unnecessary for the user.
1000 Pixel JPG	High resolution image.
150 Pixel JPG	Low resolution image.
SLQ Digitool Viewer	Download link to tiff file.

Internal assessment 3 (IA3)

Project — folio (25%)

IA3 project — folio is a collection of work in three parts. Part 1 demonstrates research and investigative practices, Part 2 demonstrates development of ideas, and Part 3 evaluates security impacts related to data exchange. Together, Parts 1, 2 and 3 demonstrate application of the iterative problem-solving process.

There is no requirement to specify a technology context for this assessment instrument. The response requires documentation to demonstrate application of the problem-solving process and a video component to demonstrate the functionality of the user-interface, data and coded components.

Assessment design

Validity

Validity in assessment design considers the extent to which an assessment item accurately measures what it is intended to measure and that the evidence of student learning collected from an assessment can be legitimately used for the purpose specified in the syllabus.

Reasons for non-endorsement by priority of assessment

Validity priority	Number of times priority was identified in decisions
Alignment	53
Authentication	2
Authenticity	10
Item construction	45
Scope and scale	10

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that:

- provided a specific dataset in JSON or XML format, including APIs
- included a stimulus uploaded as a separate PDF document containing headings and information aligned with syllabus specifications (Syllabus section 5.6.1)
- clearly identified one near-complete draft checkpoint (*QCE and QCIA policy and procedures handbook v7.0*, Section 8.2.5)
- kept Part 2 responses manageable by including prescribed criteria specific to data interfaces and data transformation to maintain a clear focus on the exchange of data between two digital systems.

Practices to strengthen

It is recommended that assessment instruments:

- include scaffolding that provides prompts and cues to students about the requirements for their response without repeating or contradicting instrument conditions or instructions

- include accessible sample datasets in JSON or XML formats, including whether this access is via API, by providing working links and representative screenshots. Maintaining local copies of datasets and including screenshots ensures the instrument remains usable if the original data source becomes unavailable
- identify a real-world problem that includes sufficient opportunity for responses to analyse a data security problem to identify risks and determine a suitable security strategy
- include contextual details that outline relevant personal, social and economic considerations to support the development of appropriate criteria and critical evaluation of the impacts of data transmission, storage and sharing (Syllabus section 5.6).

Accessibility

Accessibility in assessment design ensures that no student or group of students is disadvantaged in their capacity to access an assessment.

Reasons for non-endorsement by priority of assessment

Accessibility priority	Number of times priority was identified in decisions
Bias avoidance	0
Language	5
Layout	13
Transparency	78

Effective practices

Accessibility priorities were effectively demonstrated in assessment instruments that:

- provided stimulus and scaffolding with accessible language and minimal distractors
- included clear instructions guiding students to complete each part of the folio as three distinct parts
- used correct spelling, grammar and technical terminology consistent with Unit 4 subject matter.

Practices to strengthen

It is recommended that assessment instruments:

- preserve the syllabus hierarchy of assessable evidence in layout and formatting. Avoid separating single bullet point specifications into multiple stems (e.g. symbolise and explain) or altering list structure in a way that changes emphasis or clarity.

Additional advice

When developing an assessment instrument for this IA, it is essential to consider the following key differences between the 2019 and 2025 syllabuses:

- All changes noted for IA2 apply to IA3.
- The assessment specifications and ISMG require evidence of possible solutions, testing and feedback. Therefore, consider that
  - scaffolding could highlight that the assessment does not require a secure solution to be generated beyond the scope of Unit 4 subject matter. Therefore, evidence should focus on demonstrating the possible solutions for secure data and data repositories.

- The stimulus is no longer called a technical proposal and requires different information from that of the 2019 syllabus. Therefore, ensure that
  - all changes noted for IA2 are applied to IA3
  - proto-personas or user profiles support students to determine success criteria and the implications of data security and privacy for different user groups, and to synthesise possible solutions for data, user interfaces and programmed components
  - information about data and data repositories provides access to data sets in JSON or XML formats, including whether this access is via API, with overarching requirements regarding the storage of data, if relevant.

Assessment decisions

Reliability

Reliability refers to the extent to which the results of assessments are consistent, replicable and free from error.

Agreement trends between provisional and confirmed marks

Criterion number	Criterion name	Percentage agreement with provisional	Percentage less than provisional	Percentage greater than provisional	Percentage both less and greater than provisional
1	Retrieving and comprehending	97.18	2.11	0.70	0.00
2	Analysing	96.48	3.52	0.00	0.00
3	Synthesising and evaluating	93.66	6.34	0.00	0.00
4	Communicating	100.00	0.00	0.00	0.00

Effective practices

Reliable judgments were made using the ISMG for this IA when:

- in the Retrieving and comprehending, the evidence matched to the upper performance level demonstrated
  - descriptions of components of data exchange systems that were contextualised to the identified real-world problem and specific user needs. Accurate judgments recognised the difference between contextual responses that considered specific details relevant to the problem versus responses with generic technical descriptions with limited connection to the specific data exchange context
- in the Analysing criterion, the evidence matched to the upper performance level demonstrated
  - analysis extending beyond the identification of key features of existing solutions, methods of data exchange, security strategies and data formats. Accurate judgments recognised that insightful analysis established meaningful links between the relevant features, components and elements of similar solutions and the identified real-world problem and end-user context
- in the Communicating criterion, the evidence matched to the upper performance level demonstrated

- decision-making about, and use of mode-appropriate features within, response length conditions. Accurate judgments recognised that responses that were well organised, clearly labelled, and included a balance of written and visual features to communicate about a solution, demonstrate discerning and fluent use of project conventions
- understanding of the interdependent nature of the three-part folio structure, where Part 1 research informed Part 2 development decisions, and Part 3 security impact evaluations directly referenced components generated in Part 2, recognising the iterative problem-solving process across all criteria.

Practices to strengthen

When making judgments for this IA for the 2025 syllabus, it is essential to consider the following key differences between the ISMG in the 2019 and 2025 syllabuses:

- All changes noted for IA2 apply to IA3.

To further ensure reliable judgments are made using the ISMG for this IA, it is recommended that:

- when matching evidence to descriptors for the Determining and Synthesising criterion
  - ensure astutely determined success criteria reflect effective implementation of the problem-solving process by including measures that authentically capture the personal, social and economic impacts, and quality, appropriateness and effectiveness of the generated component or solution (2025 syllabus, p. 9), with explicit consideration of user experience, programmed components and impacts, including security and privacy
- when matching evidence to descriptors for the Generating criterion
  - accurate judgments recognise that not all security and privacy features can be generated due to constraints and limitations. While Unit 4 subject matter does not require security strategies to be implemented, responses should acknowledge these constraints and limitations when demonstrating the generated prototype solution to support understanding. This approach aligns with the determination of success criteria that will, if astute, recognise what can authentically be tested within the context of the solution.

Additional advice

Schools should:

- note that all changes noted for IA2 apply to IA3
- be aware that in the 2025 syllabus the assessment specifications and ISMG require evaluation of user experience and programmed components against criteria, and evaluation of impacts
- be aware that in the 2025 syllabus the assessment specifications and ISMG require evidence of the development of possible solutions. Drawing on Unit 4 subject matter, security and privacy considerations may be demonstrated through descriptions or pseudocode representations of relevant security strategies. There is scope for responses to acknowledge risks to data confidentiality, integrity, availability, and the Australian Privacy Principles most applicable to the problem context, and to explain how these considerations have been or could be addressed
- recognise that high-level responses make evidence-based judgments with success criteria that are specific and measurable, even when related to desired or possible personal, social and economic impacts. This supports authentic, critical evaluation. Under the revised 2025 Digital Solutions syllabus response requirements, the written responses could be streamlined into a succinct list of key outcomes.

Samples

The following excerpts have been included to show how students may demonstrate the synthesis of information and ideas to develop possible solutions for user interface, secure data and data repositories, and programmed components.

In Excerpt 1, the student presents screenshots of user-interface mock-ups, a site map, and annotations that explain the relationship between the front-end and back-end components. The annotations include codes to make direct links to the determined success criteria and explicitly communicate relevant security and privacy considerations.

In Excerpt 2, the student response includes screenshots of developed user interfaces and associated back-end components, with arrows and annotations used to communicate interrelationships. This is an example of how responses could present possible solutions for components. Including earlier iterations of solution components within the visual and written A4 response creates an opportunity to clearly identify any refinements that have been made.

Note: The characteristic/s identified may not be the only time the characteristic/s occurred throughout a response.

Excerpt 1

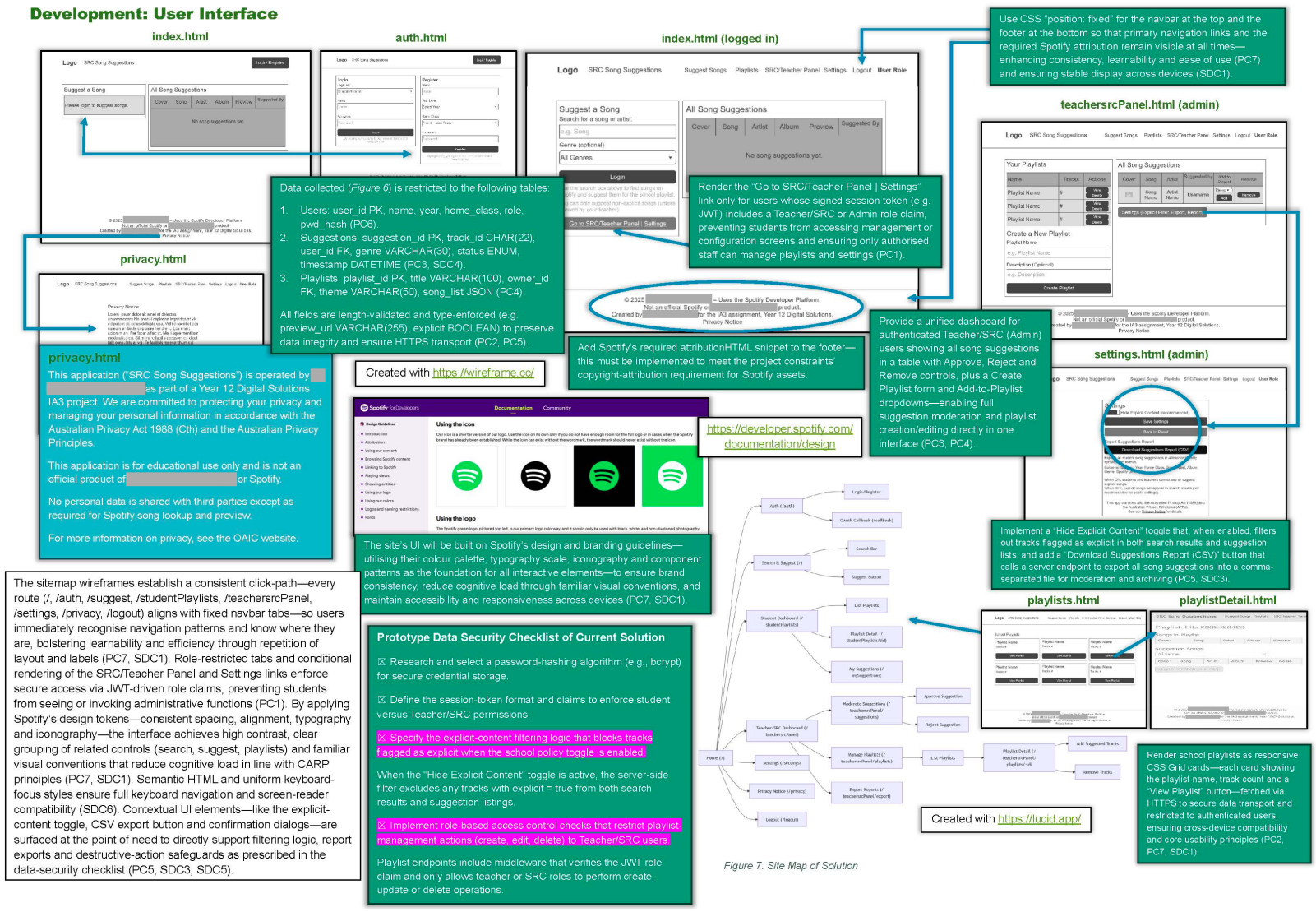
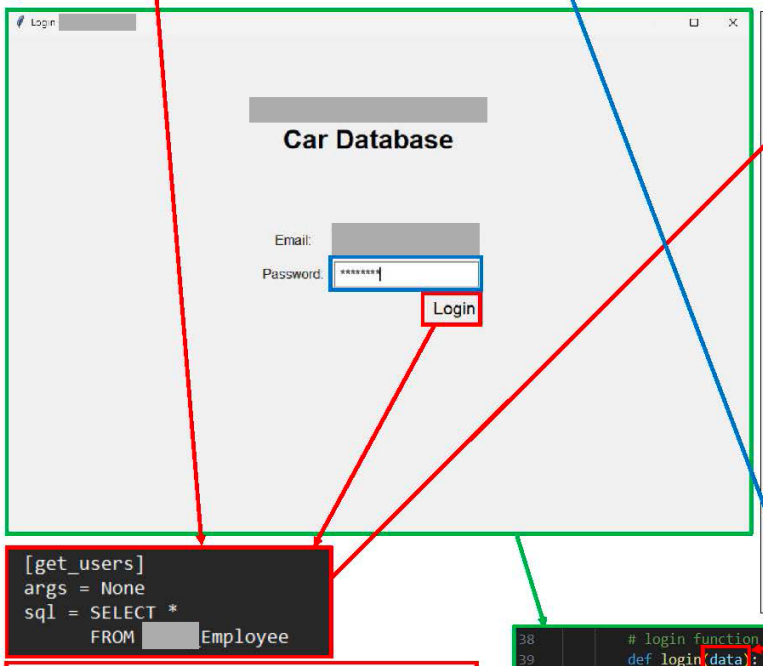


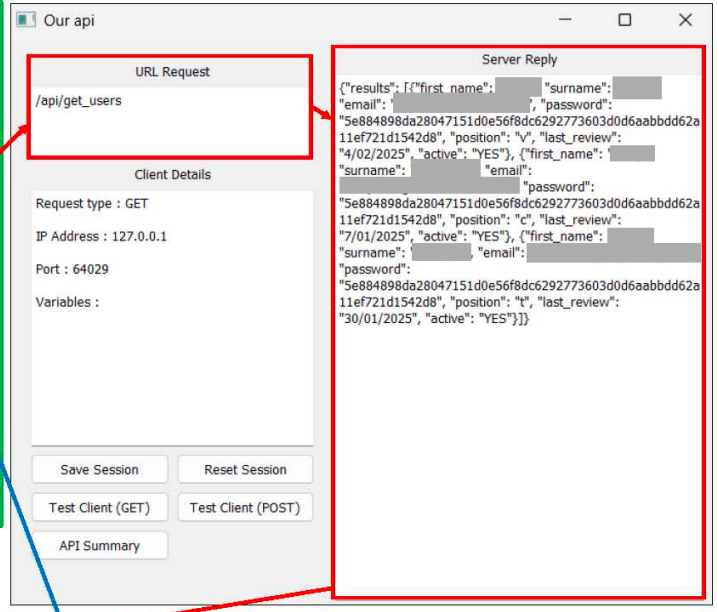
Figure 7. Site Map of Solution

Excerpt 2

Interconnections (get_users)

	first_name	surname	email	password	position	last_review	active
	Filter	Filter	Filter	Filter	Filter	Filter	Filter
1				5e884898da28047151d0e56f8dc629277360...	v	4/02/2025	YES
2				5e884898da28047151d0e56f8dc629277360...	c	7/01/2025	YES
3				5e884898da28047151d0e56f8dc629277360...	t	30/01/2025	YES






```
[get_users]
args = None
sql = SELECT *
      FROM Employee
```

The data transfer process, which requests the server to execute the 'get_users' SQL command (as defined in definitions.ini). The JSON response is the desired data to verify the login.

For data security, the password is hashed in the database with sha256. To compare the password entered into the field, the data has to be encoded as well.

Since a JSON is not a user-friendly format, the application is created to simplify the data exchange process.

```
38          # login function
39          def login(data):
40              logged_in = False
41              email = e_email.get()
42              password = sha256(e_password.get().encode()).hexdigest() # hashing password
43              for user in data:
44                  if email == user['email']: # if email matches
45                      if password == user['password']: # if password matches
46                          logged_in = True
47                          self.home_screen(user)
48              if not logged_in:
49                  l_fail = Label(self.frame_login, text="Login failed. Please try again", font=('Arial',10), fg='red')
50                  l_fail.grid(row=2,column=0,columnspan=2, sticky='W')
```

The following excerpt has been included to show how students may evaluate the personal, social and economic impacts on data security and privacy within the context of the real-world problem and generated solution.

Under the revised 2025 syllabus assessment specifications, students are expected to evaluate the programmed components and user experience against the determined success criteria, as well as impacts. In this excerpt, the student has identified the Australian Privacy Principles as an important consideration for meeting a determine success criterion (PC8). The evaluation is authentic, acknowledging where constraints prevent the implementation of security features.

Note: The characteristic/s identified may not be the only time the characteristic/s occurred throughout a response.

Elements of the Data Security Process

The APPs specify 13 different criteria. These are important considerations to meet **PC8.** Some APP's do not apply to the application, considering that a much larger ecosystem is required for them to apply (e.g. if people which were not employed by [redacted] were able to register and use the application). (OAIC, 2022)

Principle	Purpose in RACQ application
APP 1	Transparency with the user on how sensitive data (such as employee name/email/password) is used. This is outside the scope of the application and has not been provided in the proposal, so further inquiry would be required to implement this APP.
APP 2	Give team members the option of using a pseudonym. This is ultimately decided by the team coordinator; however, the application was designed so that any name can be input into the system, with the email as the primary key.
APP 3	Only give team coordinator the ability to collect information, as it is specified as a part of their role in the team.
APP 4	No unsolicited information should be able to be stored in the database. Therefore, the user database should be able to be moderated via the application to see if any unnecessary data exists without permission.
APP 5	Transparency with the user if a data breach has occurred. This does not apply to the application, this should be done through communication between clients.
APP 6	The use of personal information has been disclosed in the proposal. The proposal outlines the minimum data required for the functionality needed for the application.
APP 7	Does not apply.
APP 8	Does not apply.
APP 9	Does not apply.
APP 10	The Team Coordinator's role involves updating user activity and last review dates.
APP 11	Implementations of security strategies in application (e.g. prevention of SQL injection, hashing.
APP 12	More information is required in the proposal (e.g. if a communication/messaging system should be implemented to consult with Team Coordinator about obtaining personal data). Otherwise, it does not apply.
APP 13	Important for Team Coordinator to update as a part of his job; similar to APP 10.

Comparison of Communication Protocols

	Advantages	Disadvantages
HTTP (Hypertext Transfer Protocol)	- No decoding required, less resource intensive - Ideal for non-primitive forms of data (usually not sensitive information)	- Transmits data in plain text therefore not ideal for sensitive information transmitted in primitive data types (integer, float, string, etc.)
HTTPS (Hypertext Transfer Protocol Secure)	- Encrypts data - Ideal for primitive data types	- Slightly more resource intensive, requires the server to give the client the encryption keys for decoding the data.

(GeeksForGeeks, 2024)

The scope of the project could only allow for the use of HTTP. However, HTTPS is significantly more secure, and is therefore preferred for the process, since the data exchange process in the application specifically uses only primitive data types.

Security Strategies

Strategies revolve around being able to securely use sensitive information in the application. These aim to address mainly **APP 11**.

One way this can be done is by changing passwords from being stored in plain text, by hashing using sha256. The main benefit of using sha256 for encryption is that a longer hash is used, meaning a lower susceptibility to brute-force attacks (ideal for prototype applications, since the infrastructure to block brute-force attacks may not be developed) (SecureW2, 2025).

Additionally, all SQL is defined in the definitinons.ini file. This limits the effectiveness of SQL injection into text boxes (like username/password fields). If this were not limited, sensitive information could be vulnerable to an SQL injection attack.

External assessment

External assessment (EA) is developed and marked by the QCAA. The external assessment for a subject is common to all schools and administered under the same conditions, at the same time, on the same day. The external assessment papers and the EAMG are published in the year after they are administered.

Examination — combination response (25%)

Assessment design

The assessment instrument was designed using the specifications, conditions and assessment objectives described in the summative external assessment section of the syllabus.

The examination consisted of one paper with 10 multiple choice questions (10 marks), four short response questions (36 marks) and one extended response question (21 marks).

The assessment required students to respond to multiple choice, short response and extended response questions developed using Unit 4 subject matter.

The unseen stimulus included sample JSON data, a diagram of a smart traffic system, a set of code library function calls and the mock-up of a road maintenance mobile app.

Assessment decisions

Assessment decisions are made by markers by matching student responses to the external assessment marking guide (EAMG).

Multiple choice question responses

There were 10 multiple choice questions.

Percentage of student responses to each option

Note:

- The correct answer is **bold** and in a blue shaded table cell.
- Some students may not have responded to every question.

Question	A	B	C	D
1	1.01	9.65	16.08	**72.95**
2	**76.80**	5.04	4.48	13.24
3	10.78	2.46	13.11	**73.33**
4	**63.18**	10.78	23.58	2.02
5	1.51	**80.26**	9.90	7.69
6	2.40	**81.46**	13.93	1.89
7	5.86	11.60	**61.22**	21.12
8	**61.73**	7.38	11.16	19.29
9	12.23	1.07	35.81	**50.32**

Question	A	B	C	D
10	4.85	**86.07**	4.60	4.16

Effective practices

Overall, students responded well when they:

- analysed visual stimulus to explain relationships, identify risks and make justified recommendations
- analysed information to identify and describe the use of appropriate data structures to solve a problem
- made recommendations to improve the useability of user interfaces
- symbolised and explained user interface elements to solve an identified problem.

Practices to strengthen

When preparing students for external assessment, it is recommended that teachers:

- revise the use of desk checks to evaluate algorithmic steps and validate algorithms
- clarify the difference between data confidentiality, integrity and availability for students
- support clear understanding of the difference between the useability principles of effectiveness, safety, utility and learnability
- provide opportunities for students to practise synthesising stimulus items when responding to extended response questions, to avoid students using general knowledge when responding and not obtaining maximum marks.

Additional advice

- Note that under the revised 2025 syllabus assessment conditions, students
  - have 5 minutes for perusal
  - may now use a QCAA-approved non-programmable scientific calculator.
- New subject matter has been introduced in Unit 4. Where the required depth of knowledge is not explicitly stipulated, external assessment items will ensure equitable opportunity to respond through the provision of appropriate stimulus.

Samples

Short response

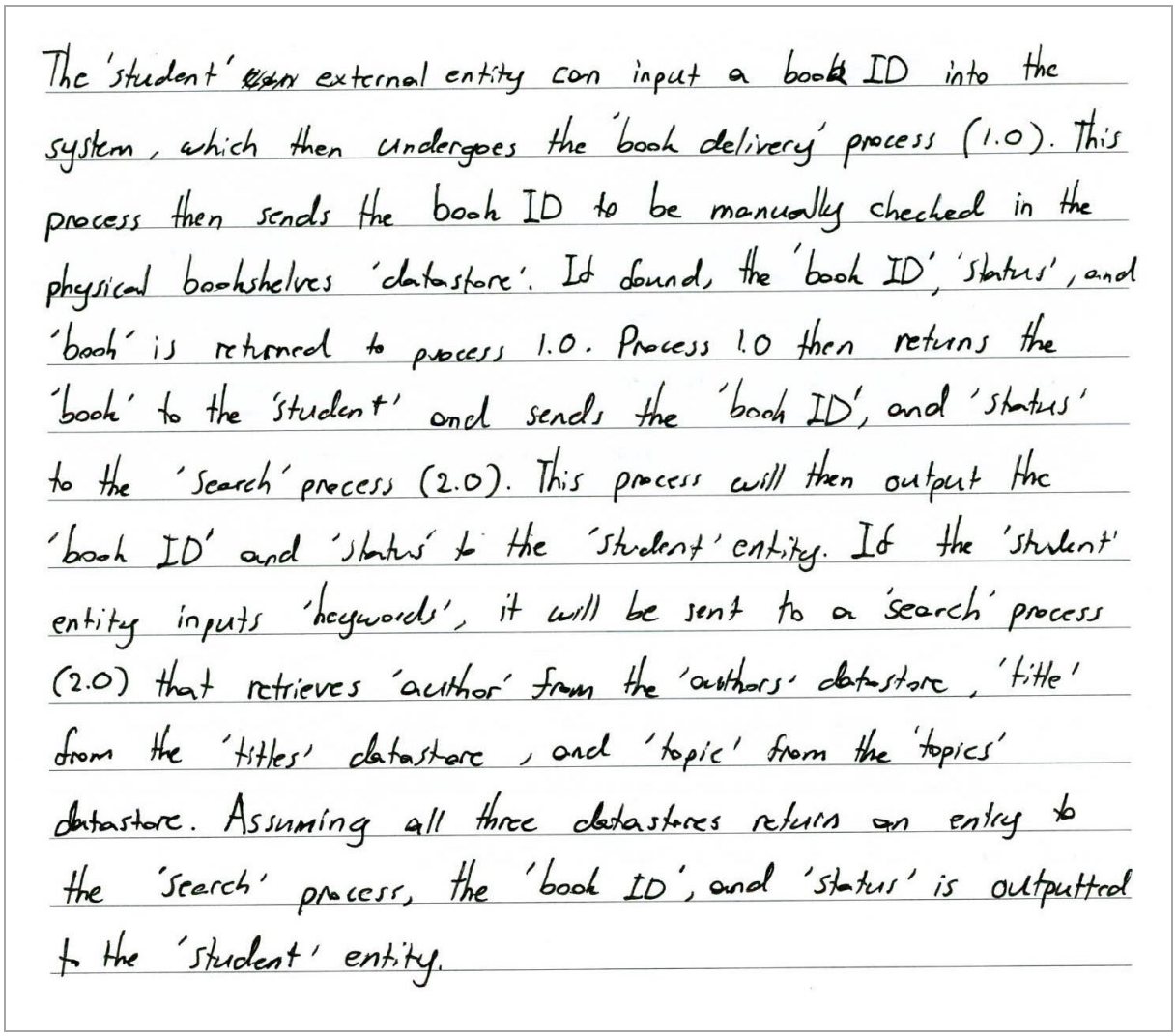
The following excerpt is from Question 11. This question required students to analyse a data flow diagram that depicts a library management system to explain the relationship between an external entity, processes and data stores. A unique aspect of the data flow diagram is that it depicts digital and analogue processes that require specific human–computer interactions.

Effective student responses:

- explained the relationships between the external Student entity and each process and data store depicted by the data flow diagram
- recognised the manual nature of the relationship between the Bookshelves data store and the Book delivery process.

This excerpt has been included to demonstrate:

- a full-mark response
- a valid variation to the sample response that showed an understanding of the physical exchange of a book between the system and a student.


The 'student' external entity can input a book ID into the system, which then undergoes the 'book delivery' process (1.0). This process then sends the book ID to be manually checked in the physical bookshelves 'datastore'. If found, the 'book ID', 'status', and 'book' is returned to process 1.0. Process 1.0 then returns the 'book' to the 'student' and sends the 'book ID', and 'status' to the 'search' process (2.0). This process will then output the 'book ID' and 'status' to the 'student' entity. If the 'student' entity inputs 'keywords', it will be sent to a 'search' process (2.0) that retrieves 'author' from the 'authors' datastore, 'title' from the 'titles' datastore, and 'topic' from the 'topics' datastore. Assuming all three datastores return an entry to the 'search' process, the 'book ID', and 'status' is outputted to the 'student' entity.

The following excerpt is from Question 12a. This question required students to analyse a scenario about a high school coding club project to identify and explain the impact of three constraints to the development of a digital solution.

Effective student responses:

- identified and explained the impact of a constraint
- clearly explained the impact of the identified constraint.

This excerpt has been included to demonstrate:

- a full-mark response
- a valid variation to the sample response that is contextualised to the school scenario.

Constraint 1: To comply with school policies, app data must be stored on the school's local servers. This means that the framework of data storage is constrained, and may not store the data for the app in an ideal manner.

Constraint 2: The app is intended for an underage demographic, meaning that app development will be ethically constrained to ensure user interfaces are appealling to younger audiences and accessible to users with disabilities.

Constraint 3: The app ~~must~~ development is constrained by time, as it must be presented at the next fundraising event in four weeks time. This could impair the app's functionality as developers must focus on code efficiency.

The following excerpt is from Question 12b. This question required students to analyse further information about the high school coding club project to determine a risk to data confidentiality, integrity and availability with justification.

Effective student responses:

- determined and justified each risk
- aligned with the definitions of data confidentiality, integrity and availability.

This excerpt has been included to demonstrate:

- a full-mark response
- a valid variation to the sample response that is contextualised to the school scenario.

Risk to data confidentiality: Users are authenticated manually. This means that someone has access to all the users' details. and sees the details of every user who logs in. this person could learn bank details, passwords and email accounts, highly risking user privacy and confidentiality.

Risk to data integrity: Account balances updating manually creates a risk of ~~intentional or unintentional~~ arithmetic or other errors leading to mistakes and inaccuracies in the account balances, significantly damaging the data's integrity.

Risk to data availability: These processes will take much longer when done manually, leading to a high wait time for users to access their data. If the user needs to urgently access their details, they will not be available immediately.

The following excerpt is from Question 13. This question required students to analyse a diagram depicting the data exchange involved in purchasing digital gift cards on a mobile app to identify and explain two points of the data exchange that are vulnerable to risk.

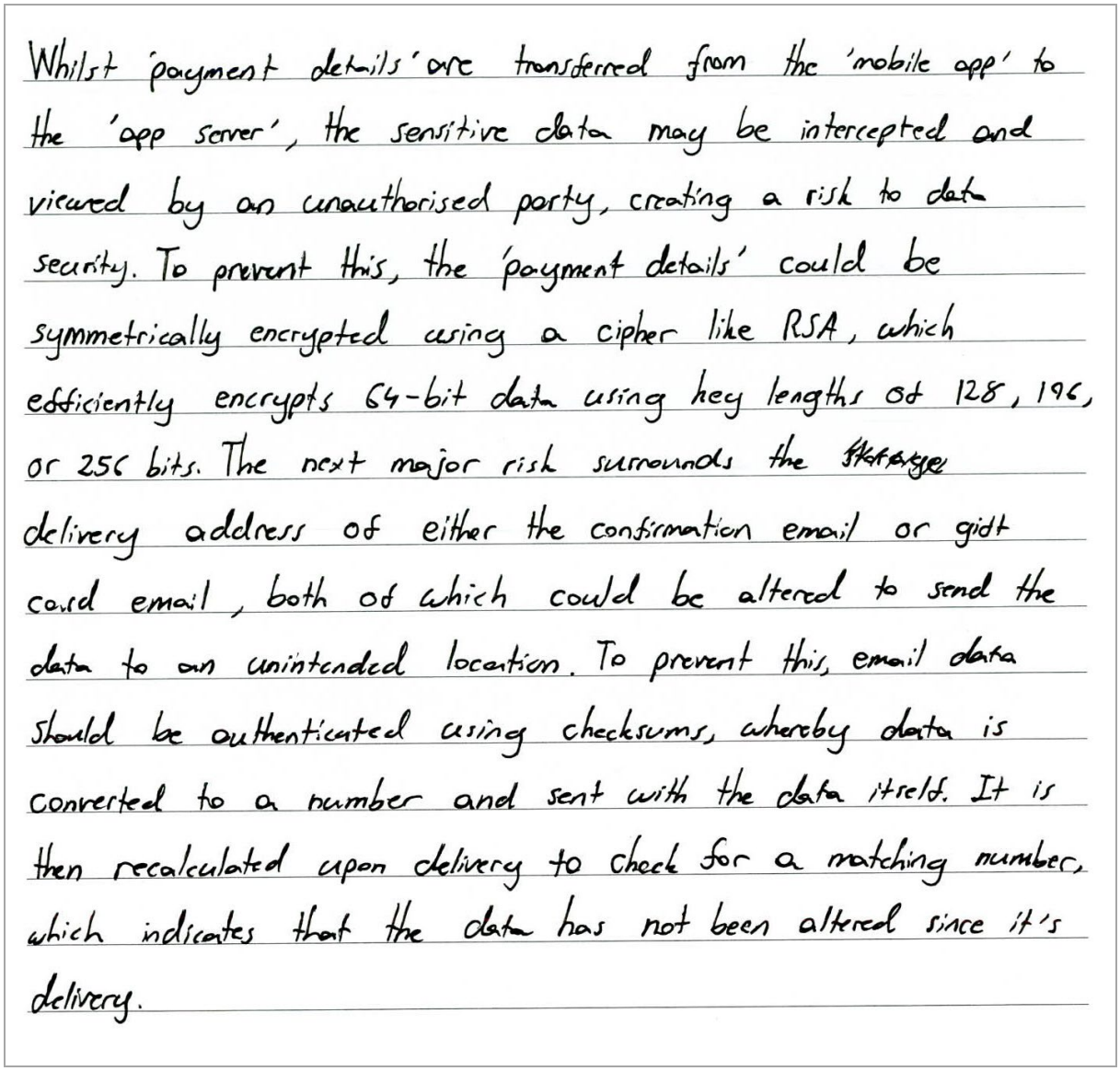
Effective student responses:

- identified and explained a vulnerability
- recommended and justified a security strategy for the identified vulnerability.

This excerpt has been included to demonstrate:

- a full-mark response

- a valid variation to the sample response that shows an understanding of the relationships between system components to accurately identify vulnerabilities and recommend appropriate security strategies.


Whilst 'payment details' are transferred from the 'mobile app' to the 'app server', the sensitive data may be intercepted and viewed by an unauthorised party, creating a risk to data security. To prevent this, the 'payment details' could be symmetrically encrypted using a cipher like RSA, which efficiently encrypts 64-bit data using key lengths of 128, 196, or 256 bits. The next major risk surrounds the ~~[illegible]~~ delivery address of either the confirmation email or gift card email, both of which could be altered to send the data to an unintended location. To prevent this, email data should be authenticated using checksums, whereby data is converted to a number and sent with the data itself. It is then recalculated upon delivery to check for a matching number, which indicates that the data has not been altered since it's delivery.

The following excerpt is from Question 14. This question required students to synthesise a sample of JSON data for two movie reviews with a pseudocode algorithm that calculates the average ratings for movies to desk check the variables from the algorithm and manually calculate the average rating for each movie.

Effective student responses:

- traced the variables used to calculate the average rating
- correctly calculating the average rating of each movie.

This excerpt has been included to demonstrate:

- a full-mark response
- a valid variation to the sample response.

Desk check all variables used to calculate the average rating for each movie. 5/3

For movie "The Legends List"

~~time~~	totalRating	numberOfReviews	loop	averageRating
	0	0	0	
	5	1	1	
	9	2	2	
	12	3	3	
			3	4

Average Rating for The Legends List is: 4

For Movie "The sequel"

totalRating	numberOfReviews	loop	averageRating
0	0	0	
2	1	1	
3	2	2	
5	3	3	
		3	1.66
			~~1.66~~

Average Rating for The Sequel is: ~~1.66~~ 1.67

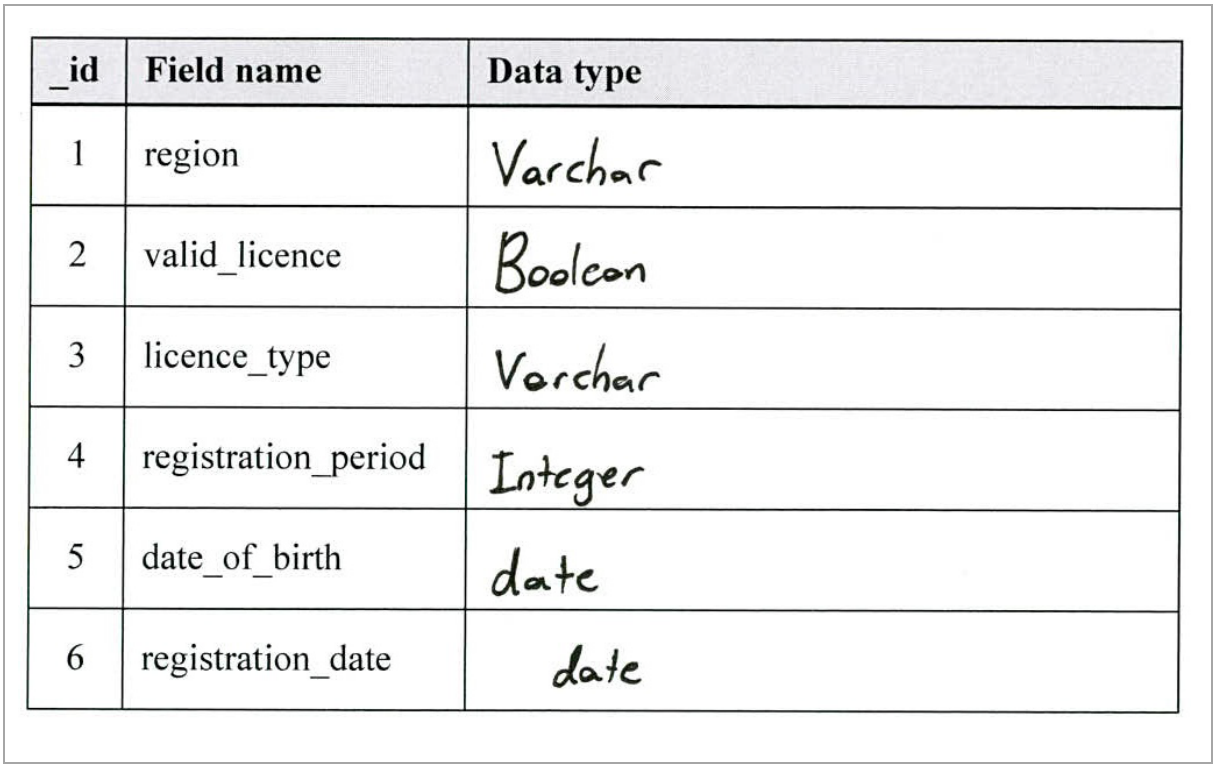
The following excerpt is from Question 15a. This question required students to analyse an excerpt of a newspaper article that includes statistics about Queensland driver licences and an incomplete data dictionary with field names that correspond to the statistics in the article to identify the data types needed for the statistics in the article.

Effective student responses:

- identified valid data types for each field name, based on the excerpt
- included data types that would allow the journalist to calculate the statistics in the article.

This excerpt has been included to demonstrate:

- a full-mark response
- a valid variation to the sample response that shows an understanding of the parameters for certain data types and how these would support the data stored by the system as identified by the field names.



_id	Field name	Data type
1	region	Varchar
2	valid_licence	Boolean
3	licence_type	Varchar
4	registration_period	Integer
5	date_of_birth	date
6	registration_date	date

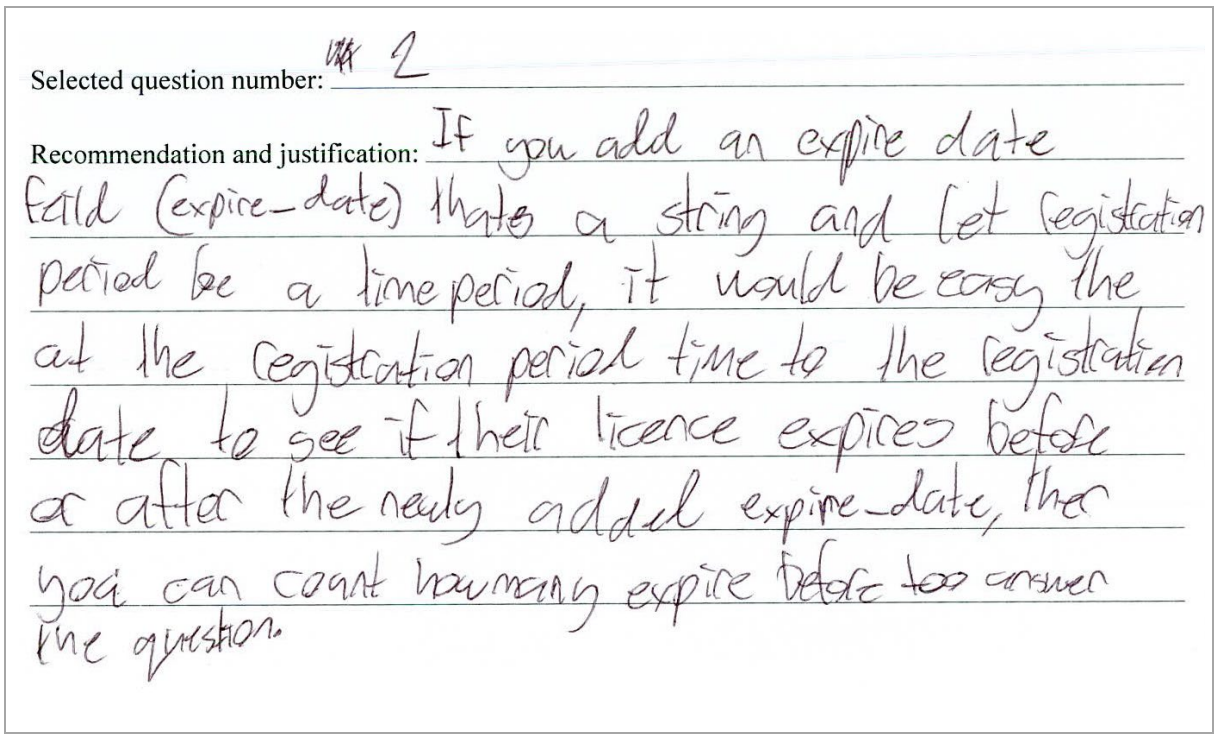
The following excerpt is from Question 15b. This question required students to recommend a change to the data dictionary in item 15a) that would allow the journalist to explore more questions for the article. Students selected one of two questions and justified their response.

Effective student responses:

- recommended a valid change
- justified the recommendation with a logical argument about how the change would allow the journalist to answer the selected question.

This excerpt has been included to demonstrate:

- a full-mark response
- a valid variation to the sample response that showed understanding of the output required to make a reasonable recommendation that can be justified with a logical argument, contextualised to the problem.


Selected question number: ~~12~~ 2

Recommendation and justification: If you add an expire date field (expire_date) that is a string and let registration period be a time period, it would be easy the at the registration period time to the registration date to see if their licence expires before or after the newly added expire_date, then you can count how many expire before to answer the question.

Extended response

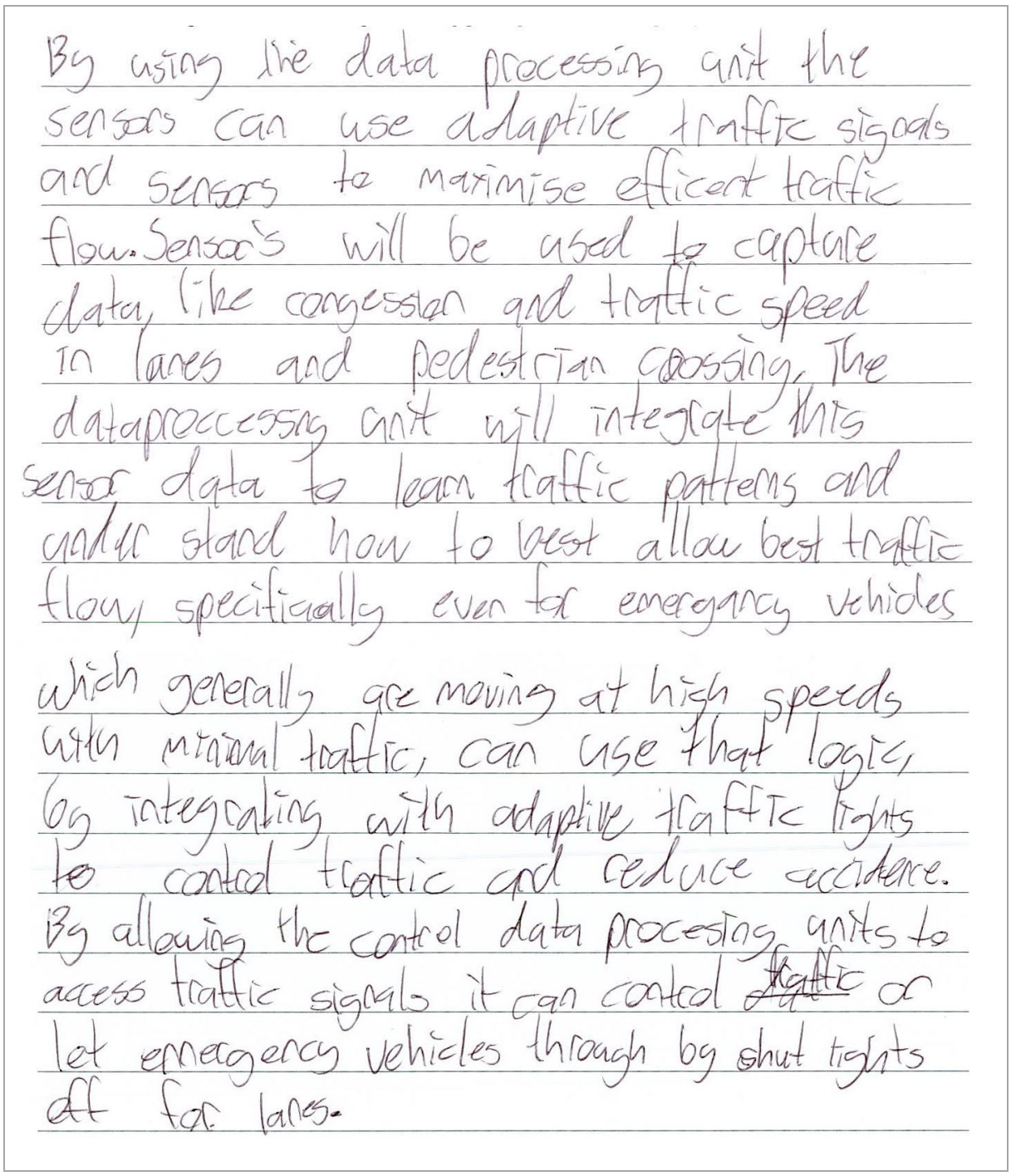
The following excerpt is from Question 16a. This question required students to synthesise information about a smart traffic management system to explain how the system components could work together to optimise traffic flow and prioritise passage for an emergency vehicle.

Effective student responses:

- explained the optimisation of traffic flow with the use of the listed system components, using analytical processes to provide additional details and elaborate on the features described in the stimulus
- explained how the system could prioritise passage for the emergency vehicle based on the synthesis of information, rather than general knowledge about traffic or car travel.

This excerpt has been included to demonstrate:

- a full-mark response
- a valid variation to the sample response that shows a clear and logical synthesis of the information to understand system interrelationships. The response is contextual to the problem and uses the information provided to respond as opposed to general knowledge about traffic or driving.


By using the data processing unit the sensors can use adaptive traffic signals and sensors to maximise efficent traffic flow. Sensor's will be used to capture data, like congestion and traffic speed in lanes and pedestrian crossing. The dataproccessing unit will integrate this sensor data to learn traffic patterns and under stand how to best allow best traffic flow, specifically even for emergency vehicles which generally are moving at high speeds with minimal traffic, can use that logic, by integrating with adaptive traffic lights to contol traffic and reduce accidence. By allowing the control data processing units to access traffic signals it can contol ~~traffic~~ or let emergency vehicles through by shut tights off for lanes.

The following excerpt is from Question 16b. This question required students to extend on the synthesis of information in 16a) and the stimulus book to use pseudocode to complete an algorithm that addressed set criteria and incorporated code library functions to solve a problem for the smart traffic system.

Effective student responses:

- symbolised an unambiguous algorithm that used pseudocode, demonstrating coherent and logical control structures, detected hazard locations, prioritised passage for emergency vehicles and kept pedestrians safe
- incorporated up to three code library functions

- included code comments to identify where criteria were addressed, with pseudocode that effectively addressed the identified criterion.

This excerpt has been included to demonstrate:

- a full-mark response
- a valid variation to the sample response that incorporates all the necessary code library functions and safety requirements with logical, structured pseudocode.

```
BEGIN

#Define the intersection roads and crossings
SET roads = ["LillyE", "LillyW","FaberS","FaberN"]
SET crossings = ["LillyE_cross", "LillyW_cross","FaberS_cross",
"FaberN_cross"]

SET emsVFlag = 0
SET vehicles = getVehicleCount(roads)
FOR road IN roads
   FOR vehicle IN vehicles DO
      IF vehicleTravelling > speedLimit THEN
         SET emsVFlag += 1
      ELSE
         RETURN vehicle
      END IF
   NEXT vehicle
NEXT road

# Locate emergency vehicles by congestion clearing then re-congesting
DECLARE pastCongestionOnce
DECLARE pastCOngestionTwice
FOR road IN roads
   SET congestion = evaluateCongestion(road)
   # Check if from high to decrease
   IF congestion = "high" OR "medium" THEN
      SET pastCongestionOne = congestion
      SET congestion = evaluateCongestion(road)
      # Check to see if it matches previous
      IF congestion != pastCongestionOne THEN
         SET pastCongestionTwo = pastCongestionOne
         SET pastCongestionOne = congestion
```

```
            SET congestion = evaluateCongestion(road)
            IF CongestionOne != congestion THEN
               emsVFlag +=1
            ELSE
               CONTINUE
            END IF
         ELSE
            CONTINUE
         END IF
      # Hazard flagging
      ELSE IF congestion = "low" THEN
         SET congestionOne = congestion
         SET congestion = evaluateCongestion(road)
         IF congestionOne = "medium" OR "high" THEN
            OUTPUT = "Potential hazard"
         ELSE
            OUTPUT = "No potential hazard"
      END IF
NEXT road

GET pedestrianInformation(crossings)

# EMSVFlag logic
IF emsVFlag = 2
   GET road WHERE emsV IS
      IF getAdaptiveSignal(road) != "green" THEN
         IF pedestrianInformation(crossings) = NULL THEN
            setAdaptiveSignal(road, "green")
         ELSE
            setAdaptiveSignal(crossing, "yellow")
            THEN
            setAdaptiveSignal(crossing, "red")
      ELSE
         EXTEND signal length
      ENDIF
ELSE
   CONTINUE
ENDIF

END
```

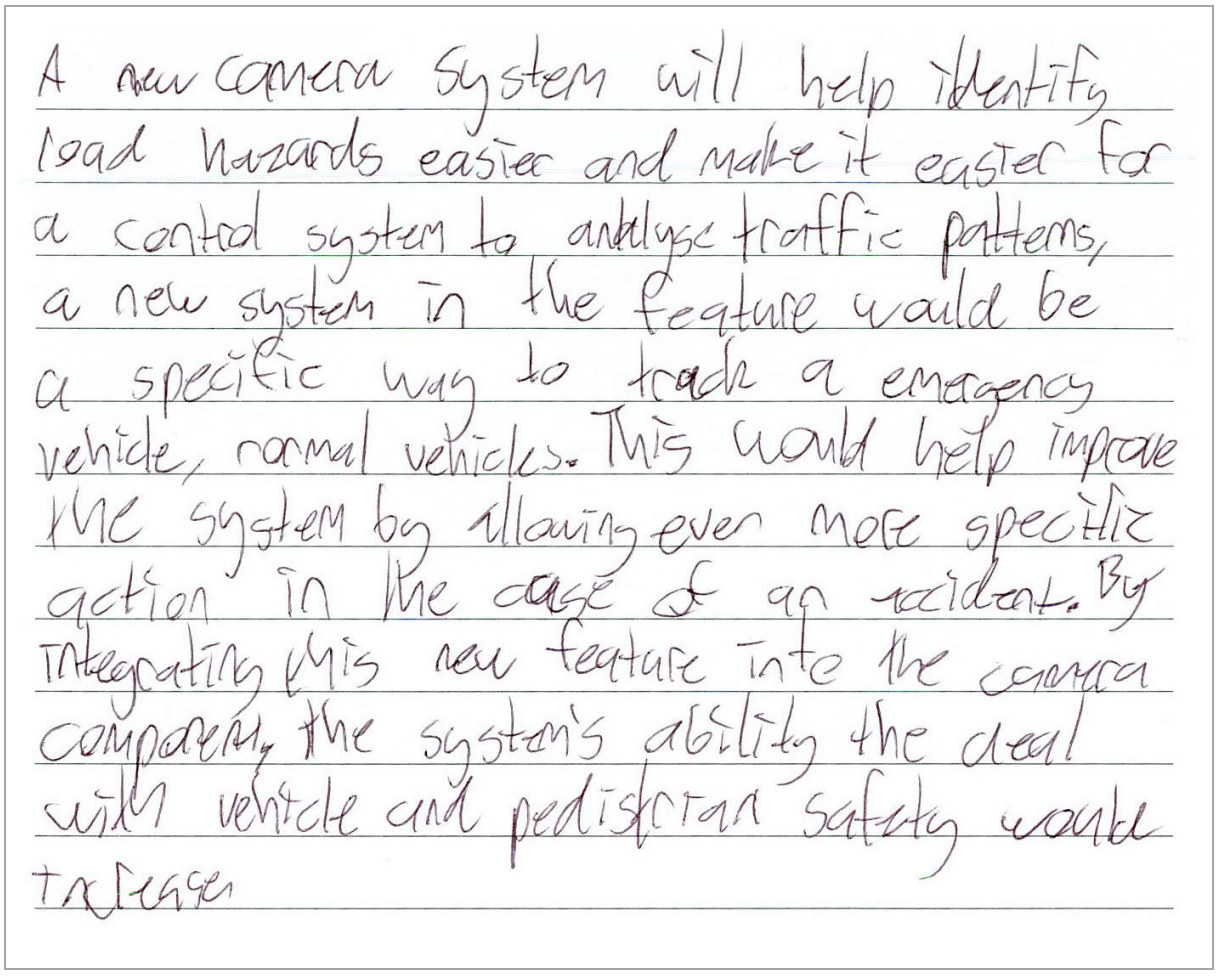
The following excerpt is from Question 16c. This question required students to synthesise information from 16a), 16b) and the stimulus book to recommend one new system feature and one new system component that would improve the safety or pedestrians and all vehicles, with justification.

Effective student responses:

- recommended a new system feature and a new system component, demonstrating a clear understanding of the difference between a feature and a component
- justified the recommendations with a logical argument.

This excerpt has been included to demonstrate:

- a full-mark response
- a valid variation to the sample response that considers the limitations of current system features and components to respond accurately and logically.


A new camera system will help identify
road hazards easier and make it easier for
a control system to analyse traffic patterns,
a new system in the feature would be
a specific way to track a emergency
vehicle, normal vehicles. This would help improve
the system by allowing ever more specific
action in the case of an accident. By
integrating this new feature into the camera
component, the system's ability the deal
with vehicle and pedistrian safety would
increase

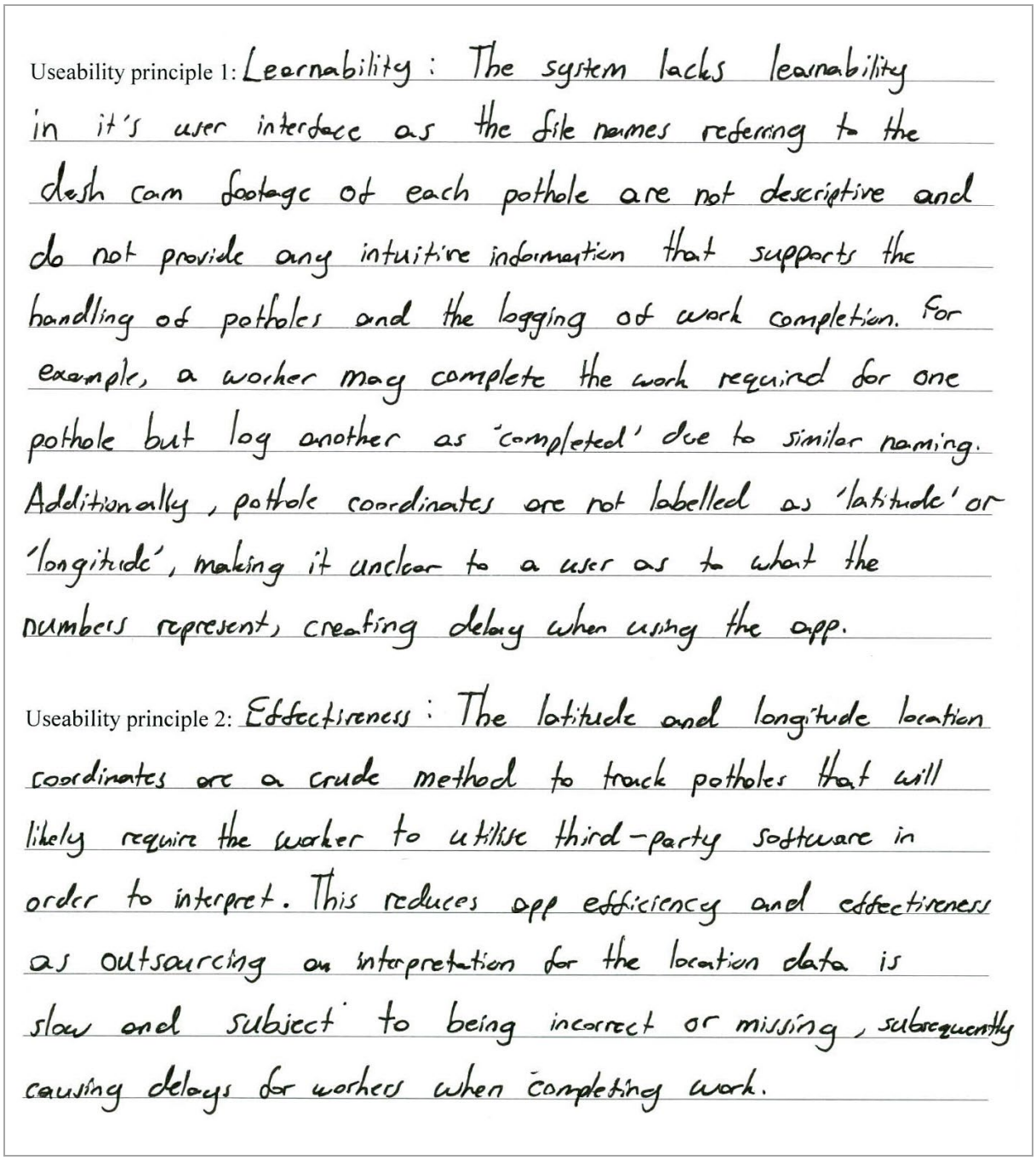
The following excerpt is from Question 16d. This question required students to analyse information about a road maintenance mobile application and evaluate the useability to identify two useability principles that had been poorly implemented, with justification.

Effective student responses:

- identified up to two observable useability principles
- justified the identified useability principles.

This excerpt has been included to demonstrate:

- a full-mark response
- a valid variation to the sample response that shows an accurate understanding of the difference between useability principles, e.g. learnability can impact effectiveness, but they are distinct components with different primary goals.



Useability principle 1: Learnability: The system lacks learnability in it's user interface as the file names referring to the dash cam footage of each pothole are not descriptive and do not provide any intuitive information that supports the handling of potholes and the logging of work completion. For example, a worker may complete the work required for one pothole but log another as 'completed' due to similar naming. Additionally, pothole coordinates are not labelled as 'latitude' or 'longitude', making it unclear to a user as to what the numbers represent, creating delay when using the app.

Useability principle 2: Effectiveness: The latitude and longitude location coordinates are a crude method to track potholes that will likely require the worker to utilise third-party software in order to interpret. This reduces app efficiency and effectiveness as outsourcing an interpretation for the location data is slow and subject to being incorrect or missing, subsequently causing delays for workers when completing work.

The following excerpt is from Question 16e. This question required students to extend their problem-solving by synthesising their analysis and evaluation of information in 16d) and the stimulus to symbolise and explain user interface features that would improve the implementation of the useability principles identified in 16d).

Effective student responses:

- symbolised and explained how each feature improved the implementation of a corresponding useability principle identified in 16d)
- clearly labelled the diagram with the identified useability principles from 16d).

This excerpt has been included to demonstrate:

- a full-mark response
- a valid variation to the sample response that was able to communicate ideas clearly using visual and written features.