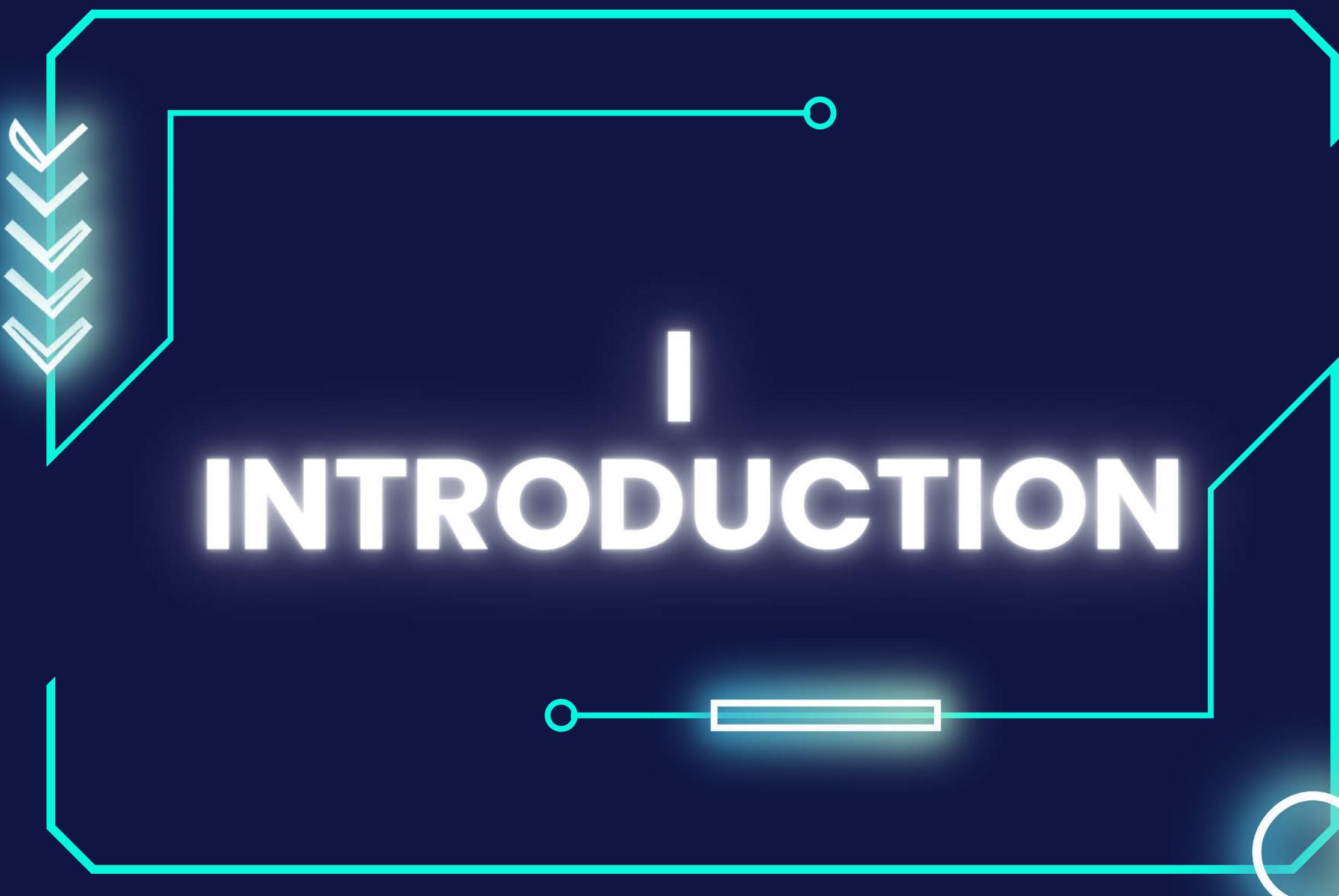




EXAM BROTHER

by Group 4 RPL





INTRODUCTION



BACKGROUND

Exam Brother is an affordable **Moodle plugin** that enhances online exam integrity through **lightweight AI** proctoring. It runs in the student's browser, detects suspicious behavior such as tab switching or unusual head and eye movements, and sends real-time alerts without automatically disqualifying students. Only event metadata is stored in the **institution's Moodle** system, ensuring **privacy** and seamless integration. Designed for smaller institutions, it provides a human-reviewed, accessible alternative to expensive proctoring solutions.



SIMILAR COMPETITOR

Exam Brother seeks to provide solutions and improve upon existing technologies, namely Safe Exam Browser (SEB) and Asesme.

SEB in itself is an excellent solution to the proctoring problem faced by educational institutions. Yet it lacks AI-based proctoring solutions. Lastly, SEB is expensive to run, requiring additional third-party proctoring tools to run it efficiently.

While Asesme does provide basic AI-based proctoring solutions, it is a standalone application. As such, it is difficult to integrate into the Moodle-based EMAS web ecosystem.



RISK ANALYSIS

False Positives

The system may inadvertently mark a test taker as **cheating**, leading to unfair treatment and inaccurate test results.

Continuous monitoring and careful calibration of the system is required.

High Latency

Exam Brother is designed to run in realtime. As such, processing delays may interfere with the **accuracy** of the system.

Optimizing system performance is essential to prevent this issue.

Privacy Concerns

Video recording is a vital part of Exam Brother's implementation. **Mishandling** of this data could violate privacy **laws**.

Strict data retention policies needs to be implemented properly.

TOOLS USED

PHP



MEDIAPIPE



MOODLE



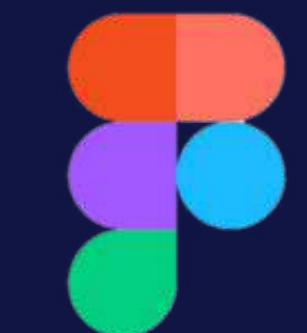
DOCKER



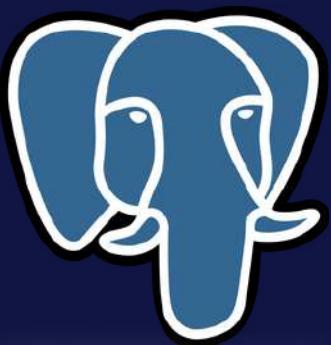
JAVASCRIPT



FIGMA



POSTGRESQL



TRELLO



VS CODE



GITHUB



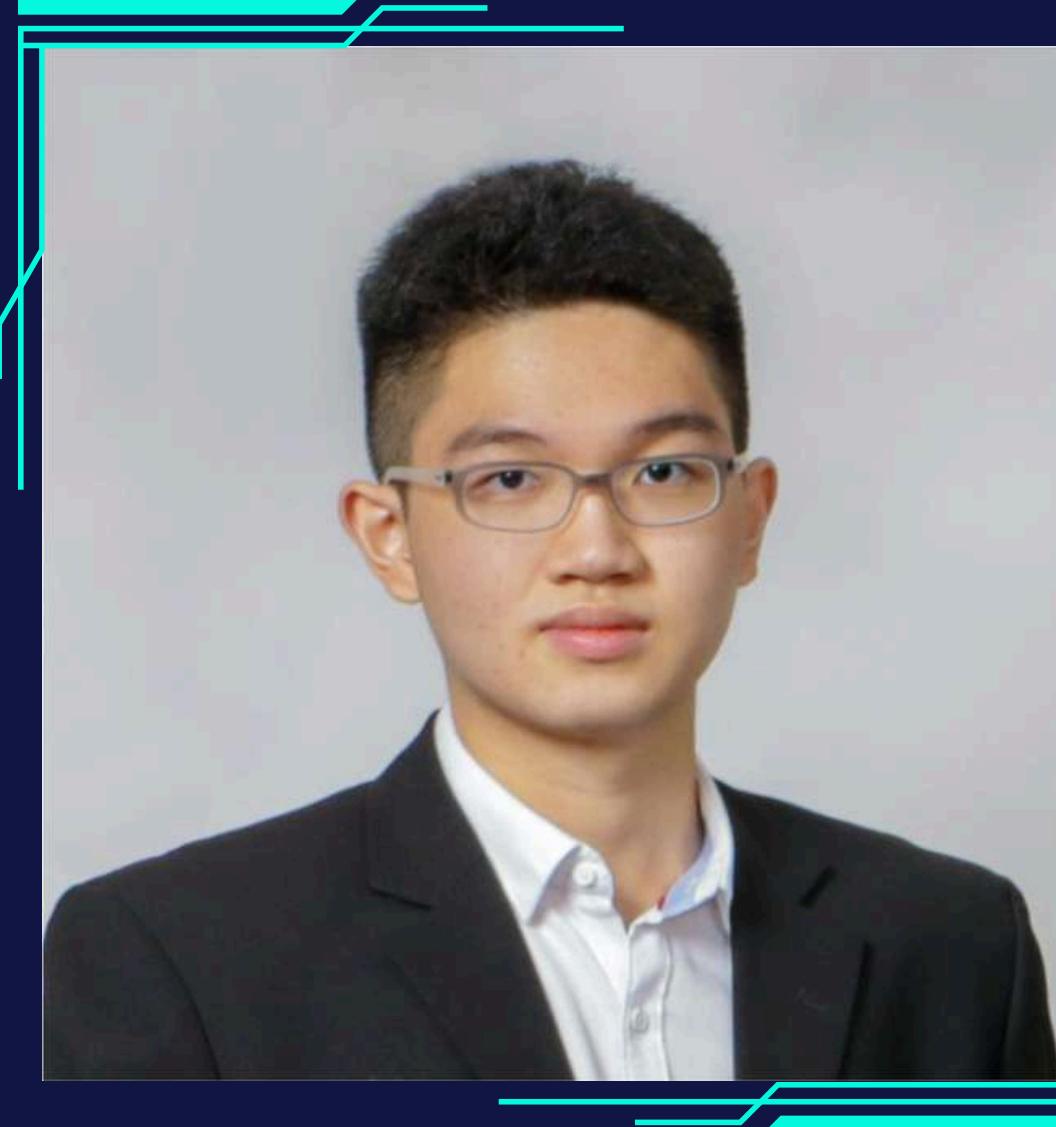


III PROJECT MANAGEMENT

MEET OUR TEAM



Maxwell Zefanya Ginting
2306221200



Bryan Herdianto
2306210885



Anthonius Hendhy Wirawan
2306161795

ROLES

Bryan Herdianto
Front-End Programmer
Application Tester

- Design and planning the page's UI
- Creating new UI for Moodle-based pages
- Unit testing

Anthonius Hendhy Wirawan
Back-End Programmer
AI Engineer

- Researching and Implementing AI using MediaPipe
- Creating APIs for communication to database

Maxwell Zefanya Ginting
Back-End Programmer
AI Engineer

- Researching and Implementing AI using MediaPipe
- Creating APIs for communication to database

TRELLO MANAGEMENT

Inbox

- Add a card
- Build basic exam page with webcam access (with consent).
- Create AJAX handler to log events to Moodle DB.
- Write unit test for event logging function.

Research Software

000

Backlog

- As a student, I want the exam page to lock navigation so I can't open other tabs.
- As a proctor, I want real-time alerts when a student looks away from the screen.
- As an admin, I want to view post-exam reports with flagged events.

+ Add a card

Sprint Backlog

- Create database schema.
- Set up Moodle plugin structure.

+ Add a card

In Progress

- Download Moodle on local.
- Style the exam interface to match Moodle's default theme and ensure responsive layout.

+ Add a card

Completed

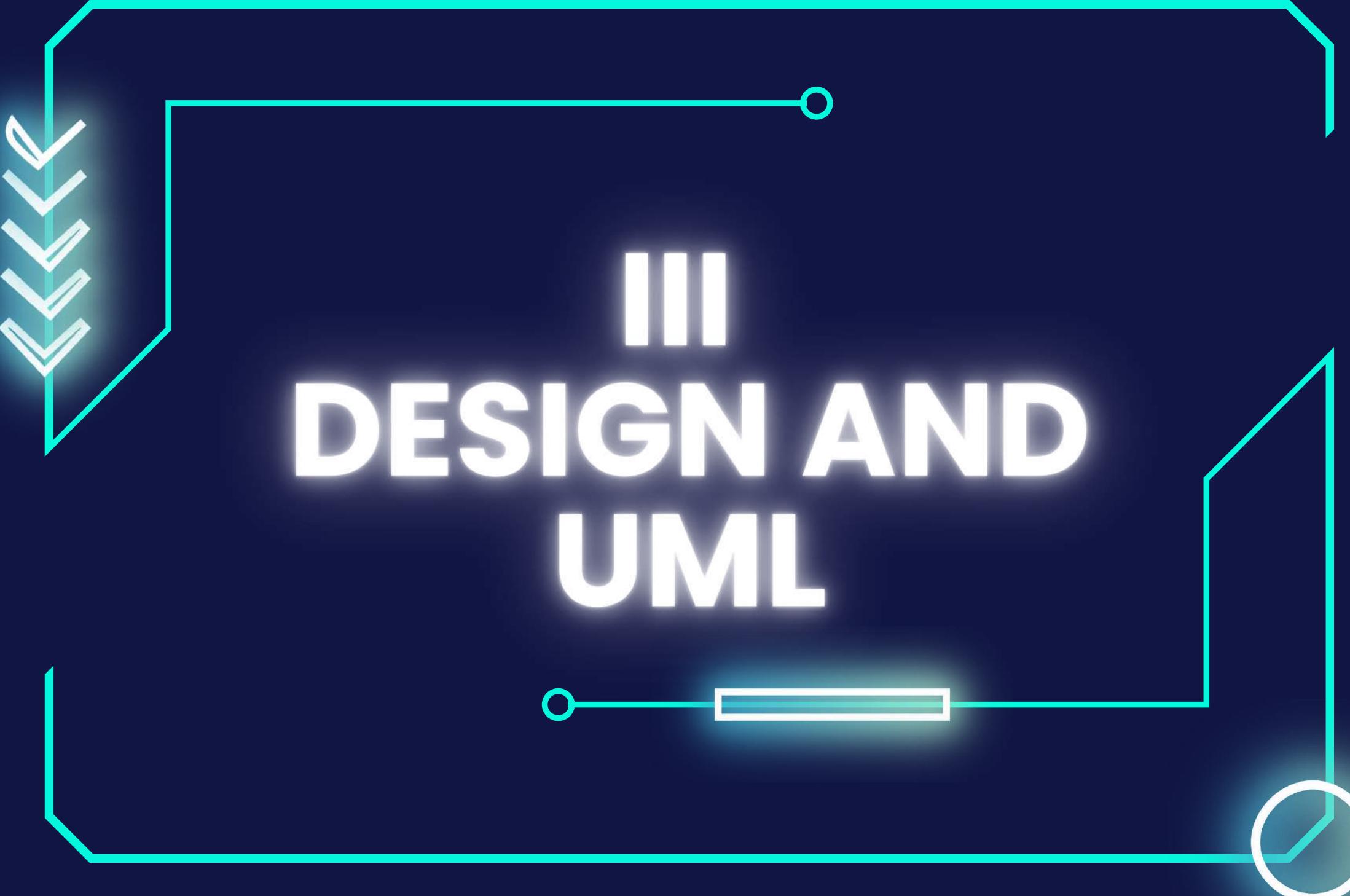
- R
- M
- + A

Consolidate your to-dos

Inbox Planner Board Switch boards

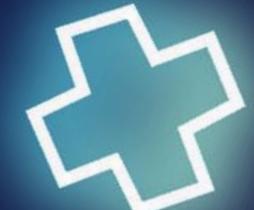
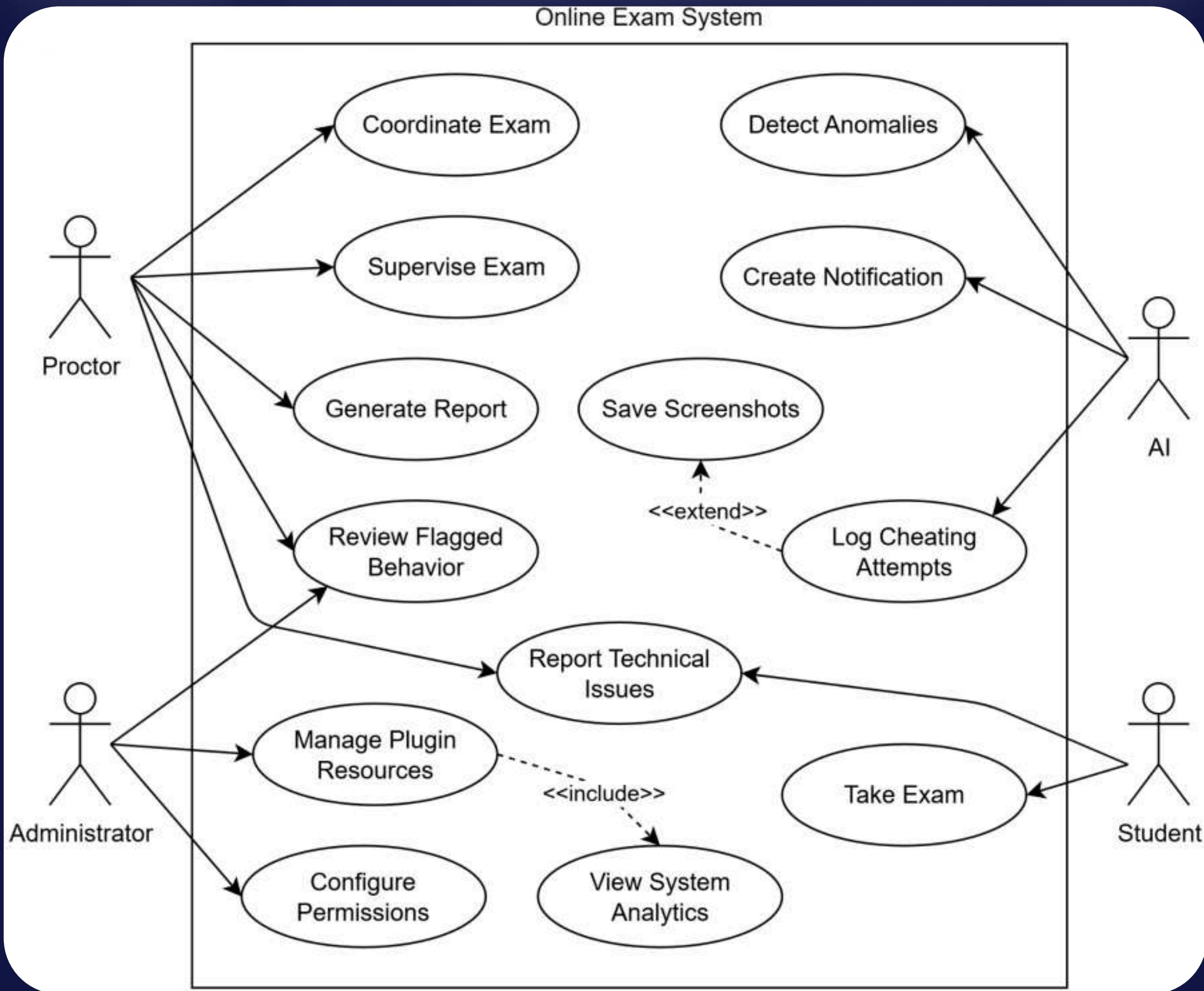
DEVELOPMENT SCHEDULE

Month		September				October				November				December			
	Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Planning																
1.1	Define core features	1															
1.2	Research Moodle plugin	1															
1.3	Identify privacy requirements		1	2	3												
1.4	Finalize scope		1	2	3												
2	Requirements & Research					1	2										
2.1	Document functional specs					1											
2.2	Compare existing tools					1											
2.3	Confirm technical feasibility					1											
3	Designing							1	2	3	4						
3.1	Create UML diagrams							1	2	3	4						
3.2	Design UI mockups							1	2	3	4						
3.3	Plan database schema							1	2	3	4						
4	Development											1	2	3	4		
4.1	Set up Moodle plugin structure											1	2	3	4		
4.2	Implement browser-based monitoring											1	2	3	4		
4.3	Build real-time alert system											1	2	3	4		
4.4	Develop proctor dashboard											1	2	3	4		
5	Testing												1	2	3	4	
5.1	Conduct unit testing												1	2	3	4	
5.2	Optimize performance and fix bugs												1	2	3	4	
6	Launching													1	2	3	4
6.1	Deploy plugin to a test Moodle													1	2	3	4
6.2	Prepare documentation													1	2	3	4
6.3	Release v1.0													1	2	3	4

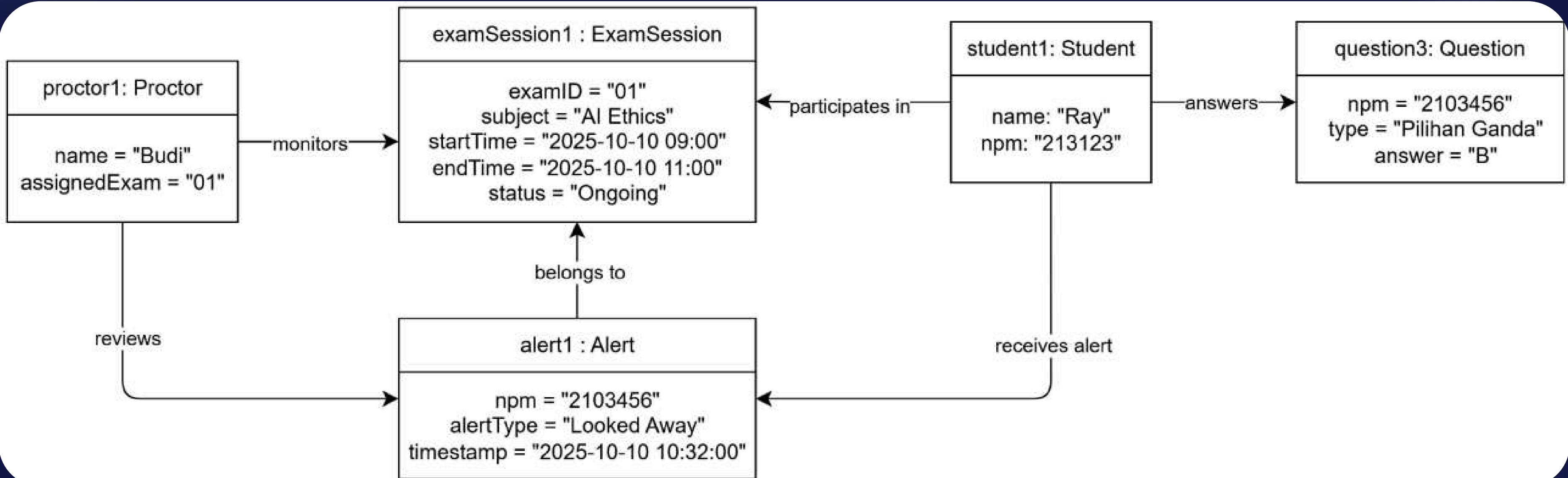


III DESIGN AND UML

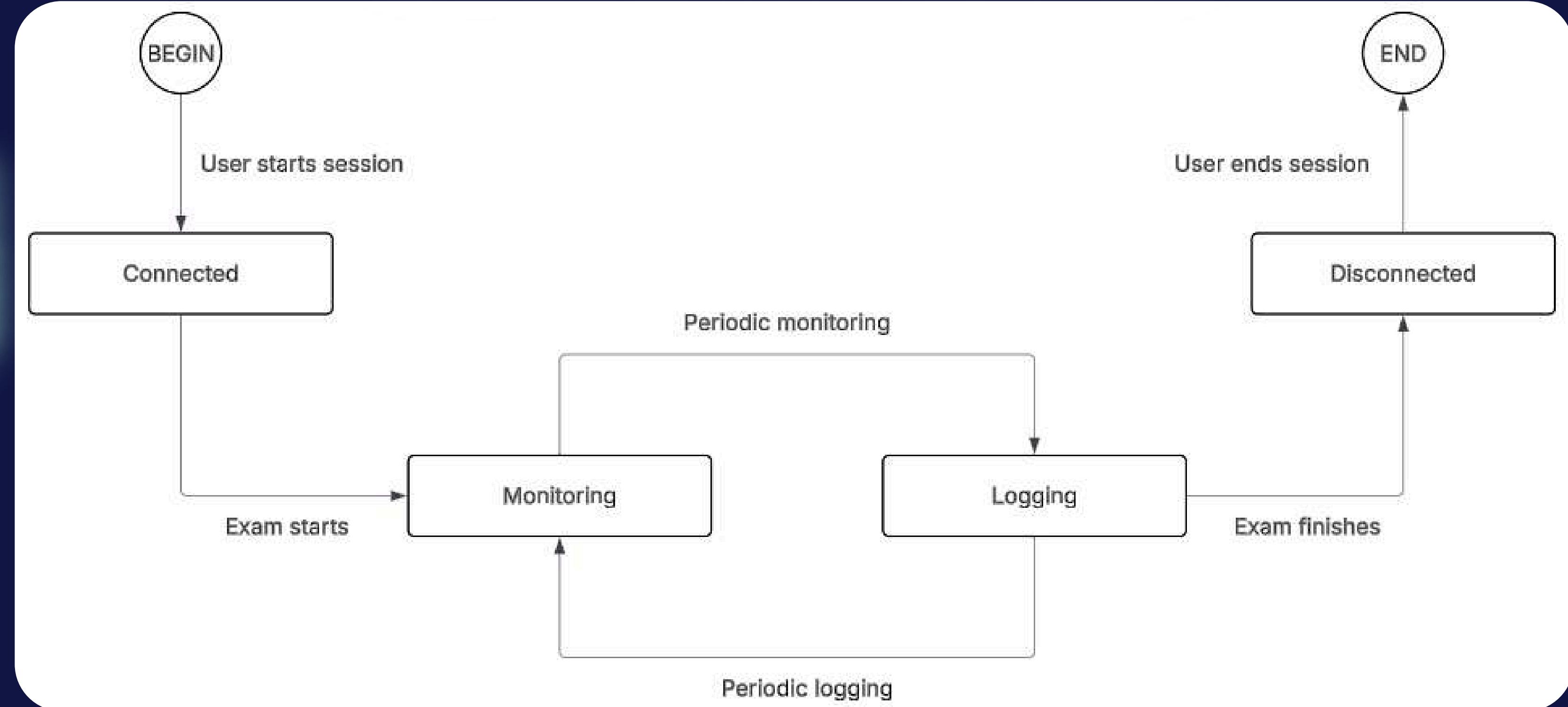
USE CASE DIAGRAM



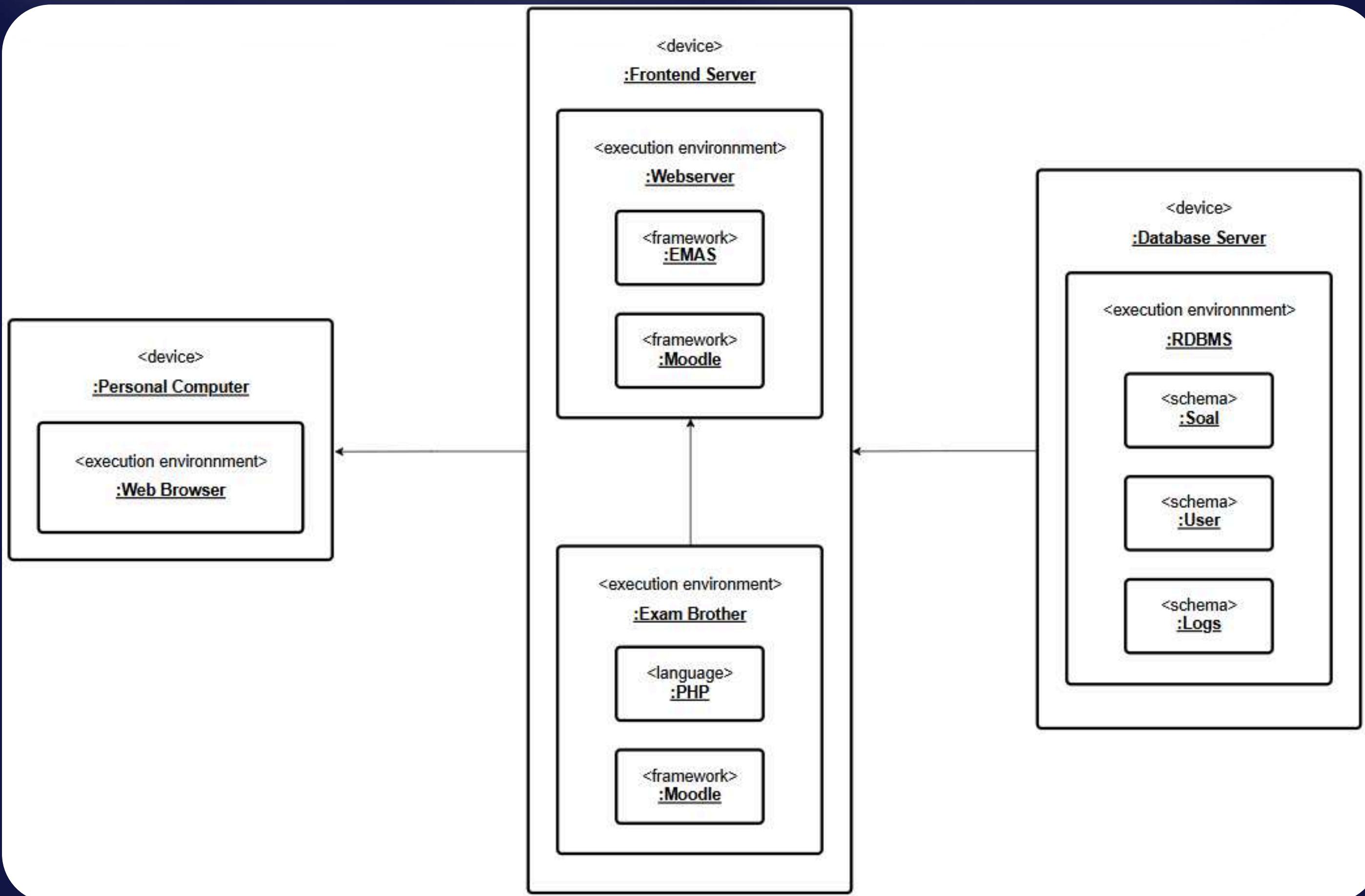
OBJECT DIAGRAM



STATE DIAGRAM



DEPLOYMENT DIAGRAM



DESIGN PROTOTYPE



STUDENT EXAM PAGE

Question 1

1.0 points

Lorem ipsum dolor sit amet. Eos beatae aliquam aut iure dicta ea numquam obcaecati. Aut consequatur officia non assumenda maiores qui rerum quisquam.

Rem totam repellendus sit tempora molestiae et blanditiis optio quo necessitatibus aperiam cum Quis nemo et galisum nesciunt. Qui fugit quos eum ratione nemo eos iusto odit in molestiae corporis est exercitationem doloremque hic impedit laboriosam.

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Time remaining

00:15:10

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15			

Camera Preview



Previous Question

Mark This Question

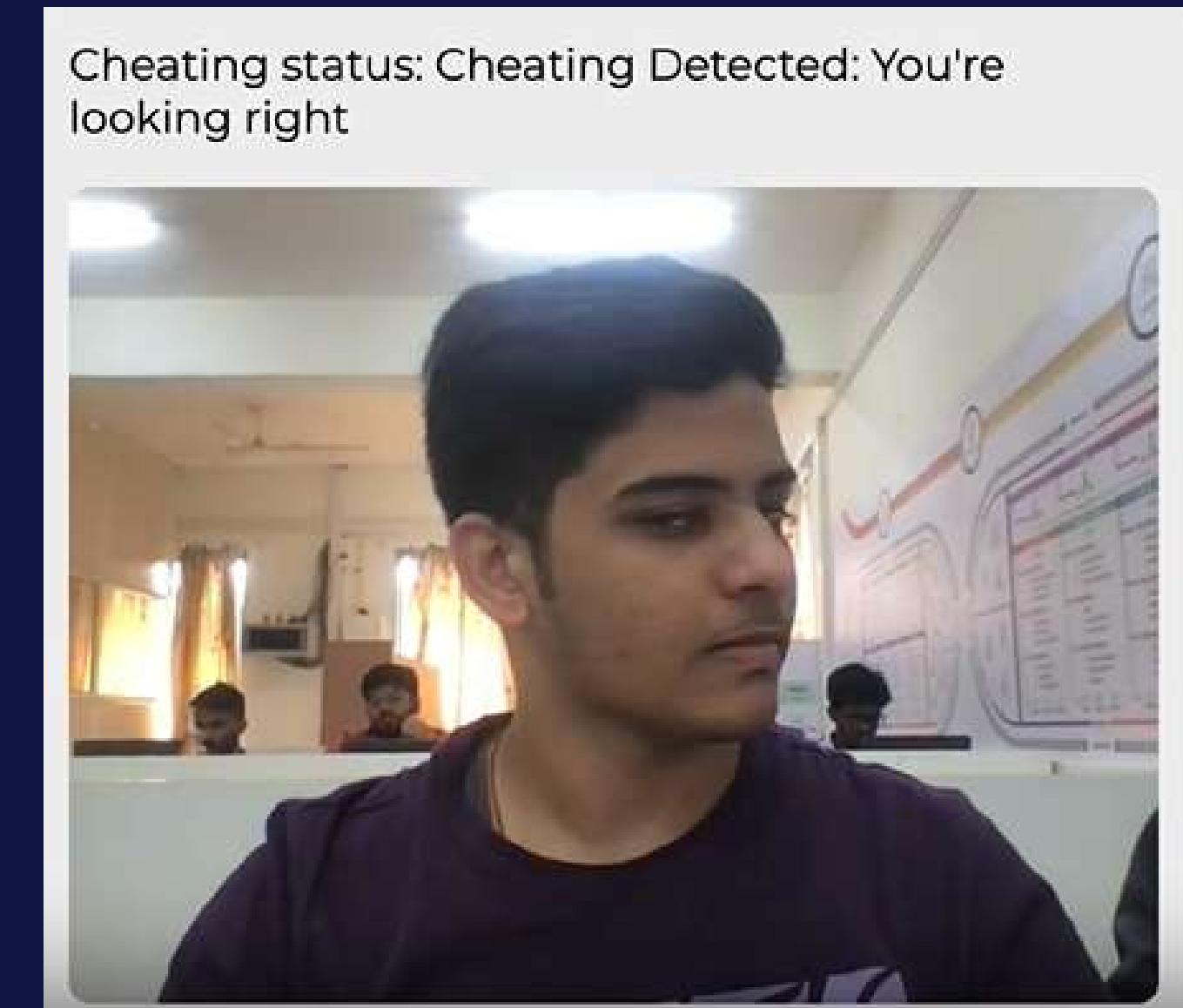
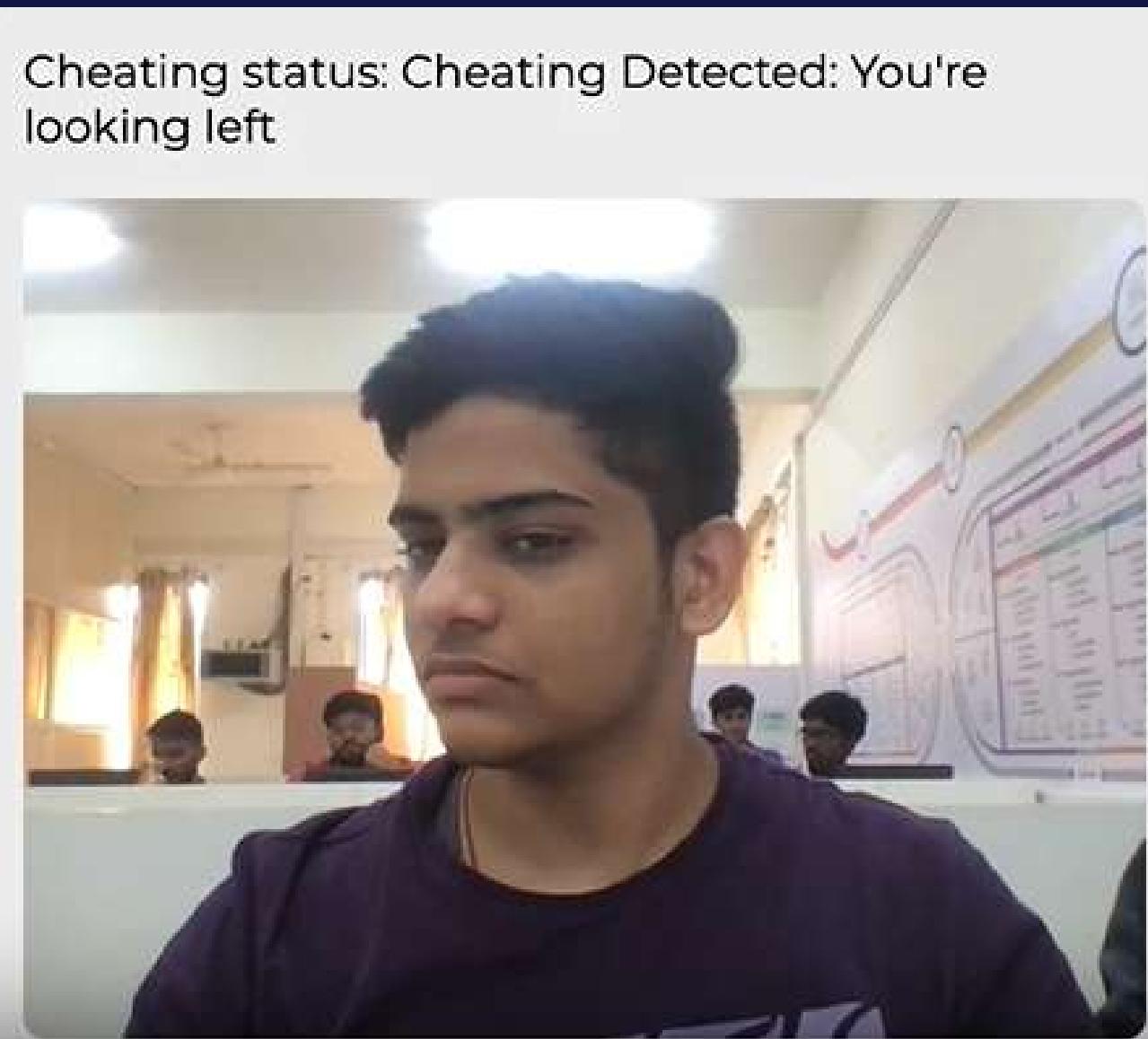
Next Question



DESIGN PROTOTYPE



REAL-TIME ALERT



DESIGN PROTOTYPE



PROCTOR DASHBOARD

Select	User picture	First name / Last name	ID number	Email address	Status	Grade	Edit	Last modified (submission)	File submissions
<input type="checkbox"/>	<input type="checkbox"/>								
<input type="checkbox"/>									
<input type="checkbox"/>									



IV TEST PLAN

TEST LEVELS



UNIT TESTING

Individual functionality such as the AI face detection, alerting system, will be tested

INTEGRATION TESTING

Ensure that the whole functionality of the system will behave and interact with each other properly

REGRESSION TESTING

Previously tested components of the Exam Brother system will be re-evaluated

ACCEPTANCE TESTING

Final test level, performed to validate that the Application Under Test (AUT) meets the client's expectations



TESTING TOOLS

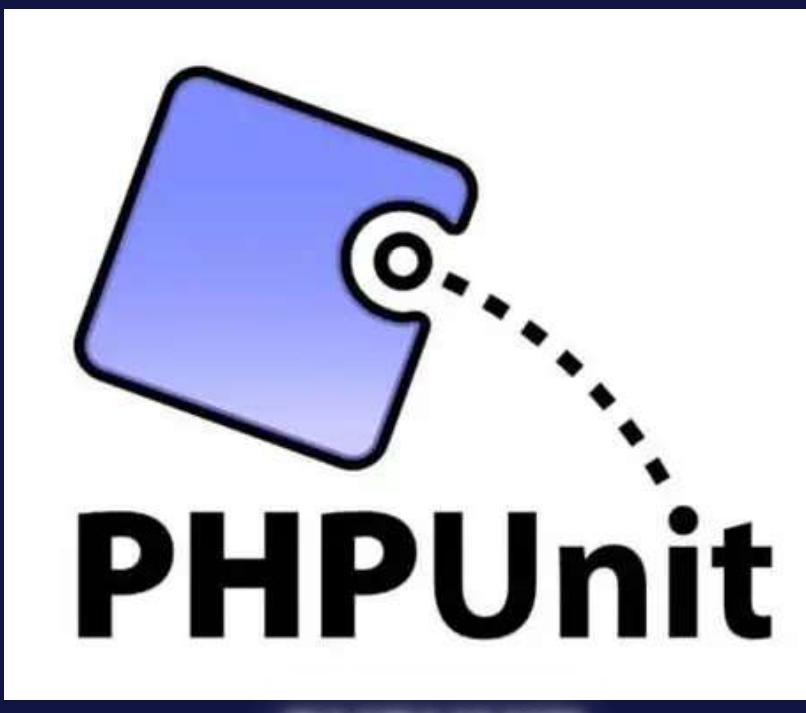


Name	Status	39% CPU	61% Memory	0% Disk	0% Network	2% GPU
Apps (4)						
> Google Chrome (27)		1.0%	664.0 MB	0 MB/s	0 Mbps	
> Snipping Tool (2)		5.6%	19.0 MB	0 MB/s	0 Mbps	
> Task Manager		1.1%	31.6 MB	0 MB/s	0 Mbps	
> Windows Terminal (4)		0%	35.6 MB	0 MB/s	0 Mbps	
Background processes (104)						
> 64-bit Synaptics Pointing Enhanc...		0%	0.5 MB	0 MB/s	0 Mbps	
AcroTray (32 bit)		0%	0.5 MB	0 MB/s	0 Mbps	
Adobe Acrobat Update Service (...)		0%	0.5 MB	0 MB/s	0 Mbps	
Adobe Genuine Software Integrati...		0%	0.9 MB	0 MB/s	0 Mbps	
AggregatorHost.exe		0%	0.8 MB	0 MB/s	0 Mbps	
Antimalware Service Executable...		0.2%	53.9 MB	0 MB/s	0 Mbps	
AnyDesk (32 bit)		0%	0.9 MB	0 MB/s	0 Mbps	

TASK MANAGER



MICROSOFT EDGE



PHPUNIT



CHROME BROWSER



TARGET AREAS



The screenshot shows a student's view of a sample exam. A yellow warning box is overlaid on the screen, stating "WARNING DETECTED" and "LOOKING RIGHT >>". The exam interface includes a question about calculating 5×5 , a camera activity indicator, and a "Submit Exam" button.

The screenshot shows the proctor dashboard for a "Sample Exam". It displays the exam name, start time (Thursday, 20 November 2025, 11:04 AM), end time (Completed at Thursday, 20 November 2025, 11:05 AM), duration (0m), and total alerts (9). Below this is an "Alert Timeline" section showing a single entry: "Head Pose" with "LOOKING RIGHT >>" and a timestamp of 11:05:10. There is also a "View Screenshot" link.

CHEATING DETECTION

ExamBrother will try to detect attempts of dishonest behaviour through various methods, such as the student looking to the side, or tab switching.

LIVE EXAM MONITOR

Proctors can monitor the progress of the exam session. The proctor can see things such as real-time alerts, and alert counts



TARGET AREAS



The screenshot shows the Proctor Dashboard with the title "Proctor Dashboard" and "Exam History". It displays a table of student exam results:

Student	Exam Name	Start Time	End Time	Duration	Status	Alerts	Actions
Admin User	Sample Exam	20 Nov, 11:04	20 Nov, 11:05	0 min	Completed	9	<button>View Details</button>
Admin User	Sample Exam	20 Nov, 09:17	20 Nov, 09:18	0 min	Completed	5	<button>View Details</button>
Admin User	Sample Exam	20 Nov, 09:12	20 Nov, 09:14	1 min	Completed	10	<button>View Details</button>
Admin User	Sample Exam	5 Nov, 18:55	20 Nov, 09:12	21016 min	Completed	0	<button>View Details</button>
Admin User	Sample Exam	5 Nov, 18:54	5 Nov, 18:55	0 min	Completed	6	<button>View Details</button>

Purge all caches
Reactive instances: This page has no reactive instances.

The screenshot shows the Proctor Dashboard with the title "Proctor Dashboard" and "Screenshots (5)". It displays a list of screenshots with timestamps and labels:

- 09:18:17 Head Pose
- 09:18:12 Head Pose
- 09:18:07 Head Pose
- 09:17:56 Head Pose

LOOKING RIGHT >>

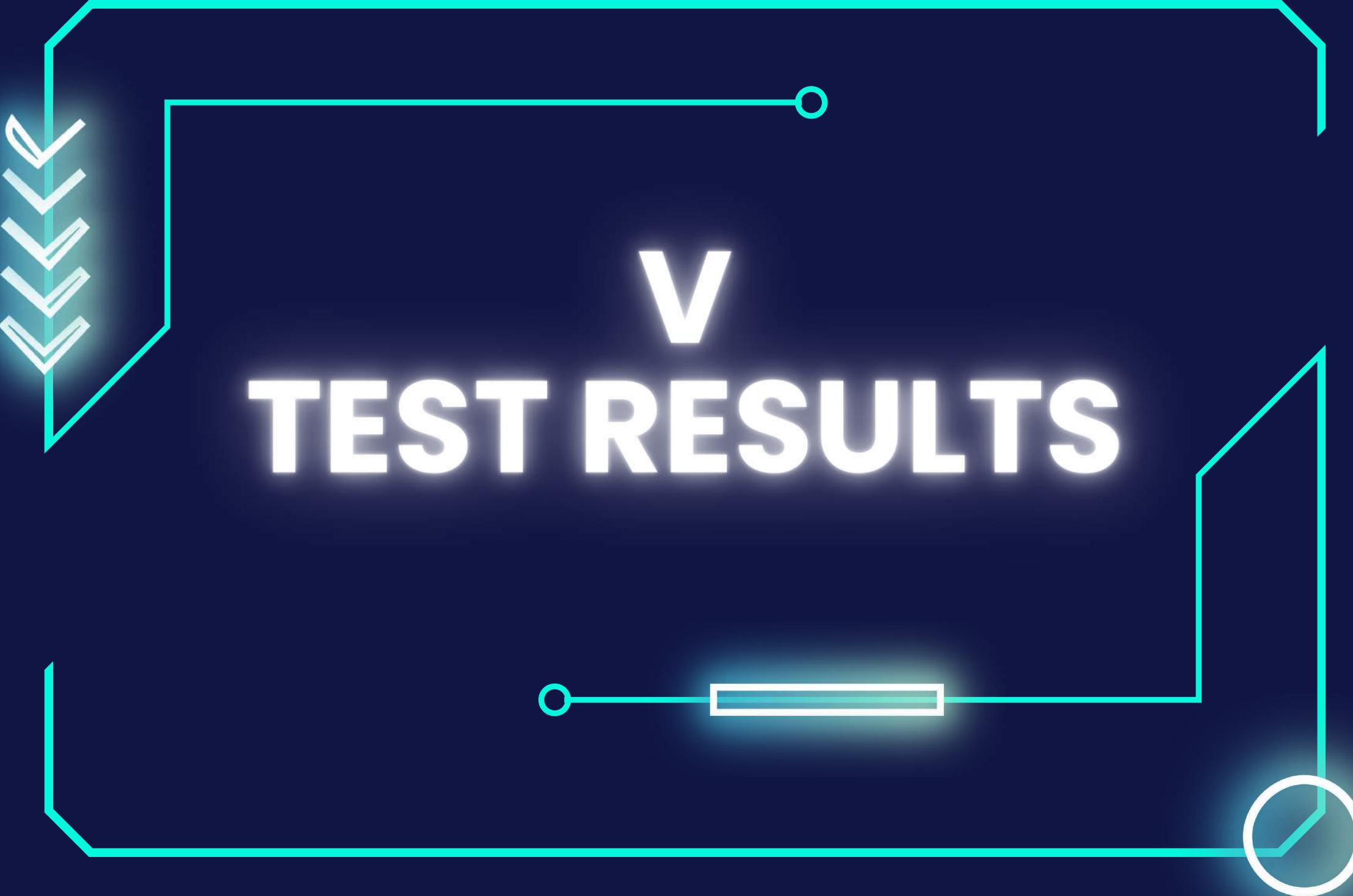
POST-EXAM REPORTS

After the exam ends, proctors can see reports of all the students. If the student was marked suspicious, the proctor can then see the details.

CHEATING ATTEMPT LOG

Proctors can see the details of students who have been recorded attempting to cheat. These details are timestamp and screenshot.





TEST RESULTS



UNIT TESTING



As the scope and complexity of a system grows, there is a growing need of a way to check that the changes made on the system doesn't alter it's correctness. The way we tried to ensure this lasting correctness is by implementing **unit testing**.

These tests are made in a way that they can **test** components **individually**, making them a bit more decouple from the system logic itself, meaning it can maintain correctness over multiple change iterations.



TEST UNITS

test_create_session

Verifies that a new exam monitoring session can be created and stored in the database

test_log_alert

Confirms that alerts (head pose violations) can be logged against a session

test_complete_session

Ensures that a session can be properly marked as completed with an end time

test_tab_switch_alert

Validates that tab switch violations are correctly recorded with the proper alert type

UNIT TEST RESULT

```
Time: 00:17.962, Memory: 44.00 MB
```

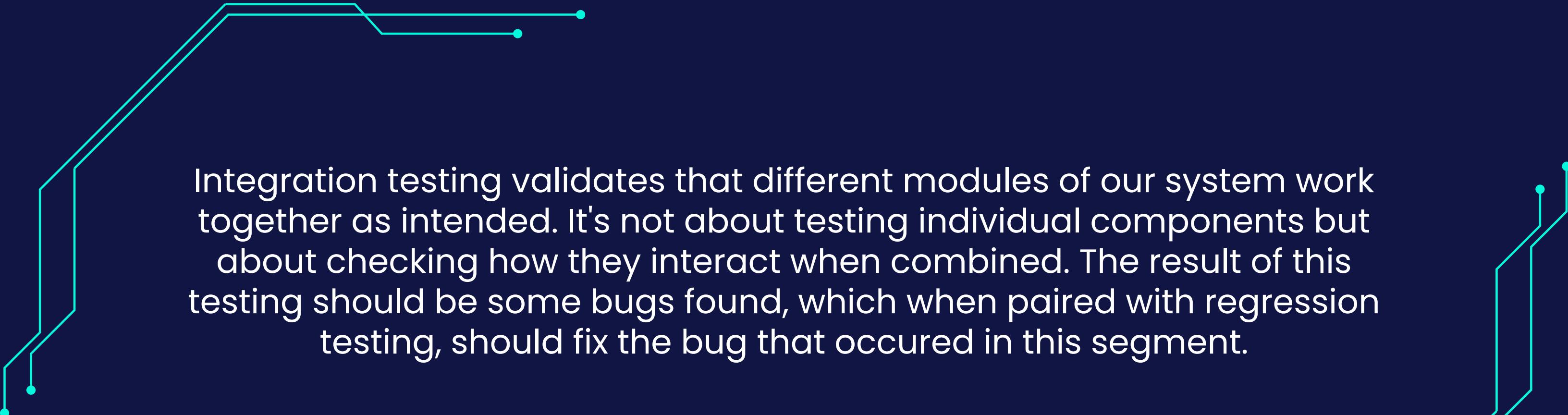
```
OK (4 tests, 8 assertions)
```

From the above image, we can see that **4 tests were executed, 8 assertions were validated, and that all tests passed successfully.** These tests ensure that the plugin's database operations for session management and alert logging are functioning as expected.



INTEGRATION TESTING

Integration testing validates that different modules of our system work together as intended. It's not about testing individual components but about checking how they interact when combined. The result of this testing should be some bugs found, which when paired with regression testing, should fix the bug that occurred in this segment.



BUG SEVERITY TABLE

Severity 0

Will never be fixed. The bug does not affect the core functionality of the plugin and does not cause any inconvenience.

Severity 1

Will be fixed later. The bug is inconvenient for users but does not interfere with the core functionality of the plugin.

Severity 2

Will be fixed immediately. The bug adversely affects the core functionality of the plugin and will be prioritized during bug fixing.

Severity 3

Requires urgent fixing. The development team will halt all other work and address this bug as soon as possible.



ROLE-AGNOSTIC DASHBOARD

The screenshot shows the Exam Brother dashboard with the following sections:

- Take Exam:** Start a monitored exam session with camera tracking and cheating detection. Includes a "Start Exam" button.
- Live Monitoring:** Monitor active exam sessions in real-time and receive instant alerts. Shows 0 active session(s) and a "View Live Monitor" button.
- Exam Reports:** View detailed reports and screenshots from completed exam sessions. Shows 5 total exams and 24 total alerts, with a "View Dashboard" button.

**Status: FAILED
Severity: 1**

The current dashboard is unable to differentiate between proctors and students. As a result, students are able to access live monitoring features and exam reports.



PERMANENT ALERT

A screenshot of a web-based exam interface titled "Sample Exam". At the top, there are navigation links: Home, Dashboard, My courses, and Site administration. The main content area shows two questions: Q1: "What is the capital of France?" and Q2: "Calculate 5 * 5". Below the questions is a video camera preview window labeled "Camera Active". A prominent yellow warning box is overlaid on the screen, containing the text "WARNING DETECTED" with a warning icon, "LOOKING RIGHT >>" with a right-pointing arrow, and "Proctorina Monitor Active". In the top right corner of the browser window, there is a status message: "Your session ID: 6 is being logged." At the bottom of the page, there is a footer bar with a "Purge all caches" link and a message stating "Reactive instances: This page has no reactive instances."

**Status: FAILED
Severity: 2**

When a student is flagged as suspicious, an alert appears on their screen. Normally, this alert should disappear automatically, but in the current implementation it remains visible until the session ends.





QUIZ INTEGRATION

The screenshot shows a Moodle-based quiz interface titled "Sample Exam". It displays two questions: "Q1: What is the capital of France?" and "Q2: Calculate 5 * 5". Below the questions are input fields for answers and a "Submit Exam" button. To the right of the main content is a "Proctoring Monitor" window with the status "Active". The monitor interface includes a video feed placeholder and the text "Monitoring user head pose...". At the bottom of the page, there is a black bar containing the text "Purge all caches" and "Reactive instances: This page has no reactive instances."

Status: FAILED
Severity: 3

The questions inside the plugin's quiz are not yet integrated with Moodle's native quiz system. As a result, teachers cannot freely add, edit, or manage questions using Moodle's built-in quiz features



REAL-TIME ALERTS

The screenshot shows a proctoring software interface. At the top, there are three buttons: "Last updated: 7:26:18 PM", "Refresh Now", and "Auto-refresh (5s) with a checked checkbox. Below this, the user profile is displayed: "Bryan Herdianto" and "Test Quiz". The session status is shown as "Active". Session details include "START TIME: 19:21:13" and "DURATION: 05:08". An "ALERTS:" section shows a green bar with the number "0". Under "Recent Alerts", it says "No alerts". At the bottom, there are two buttons: "View Details" (blue) and "End Session" (red). In the "Real-time Alerts" section, three entries are listed: "15:42:22 Bryan Herdianto: TAB SWITCH DETECTED (3/3)", "15:42:11 Bryan Herdianto: TAB SWITCH DETECTED (2/3)", and "15:42:03 Bryan Herdianto: TAB SWITCH DETECTED (1/3)".

Status: SUCCESS

During testing, these alert triggers were monitored across different scenarios to ensure consistent and accurate detection. The system successfully generated immediate alerts for each simulated behavior, and the proctor dashboard updated in real time without noticeable delay.



CAN STUDENTS START EXAM WITHOUT CAMERA?

⚠ Exam Paused

You must start your camera to view the exam questions.

Please click "Start Camera" in the widget.

Status: SUCCESS

Students can't start the exam if they haven't started their camera. There is a white overlay that blocks them from viewing it. They also can't inspect it to delete the overlay.



REGRESSION TESTING

The diagram features a dark blue background with a central white rectangular area containing text. A thick, light blue line forms a stylized path that enters from the left, goes up, then down, then up again to the right. Small circular markers are placed at the vertices where the path turns. Another similar path starts from the bottom right, goes up, then down, then up to the left, also ending with small circular markers. In the center, where the two paths would meet, there is a large white rectangular box containing the following text:

After doing integration testing, we have found a bunch of things to develop and fix, because we are using the spiral model, we are going to develop things and fixing all the bugs we found. After developing the software, we are going to do regression testing, where we test are the bugs we found before have been fixed yet or not, and then we ensure all the features are working flawlessly.





DOES PLUGIN SHOW?

Test Course

Course Settings Participants Grades Activities More ▾

General

- Announcements
- Test Quiz

New section

New section

Reports
Question banks
Content bank
Course completion
Badges
Competencies
Filters
Unenrol me from this course
LTI External tools
Accessibility toolkit
Exam Brother
Course reuse

Exam Brother plugin shows up in the tabs of the Course feature in Moodle. This will make proctors and teachers to navigate freely to start proctoring exams or quizzes.



IS PLUGIN HIDDEN FROM STUDENTS?

The screenshot shows a user interface for a learning management system. At the top, there's a navigation bar with 'My courses' and other icons. Below it, a course card for 'Test Course' is displayed. The course card includes a thumbnail of a person, a title 'Test Course', and tabs for 'Course' (which is selected), 'Participants', 'Grades', 'Activities', and 'Competencies'. The main content area of the card is currently empty.

From the student's perspective, they can't access the real-time monitoring and reports from Exam Brother. They can only access the quiz that is integrated with Exam Brother.



REAL-TIME ALERTS

Status: SUCCESS

The screenshot shows a Moodle quiz interface. At the top, there's a red banner with the text "NO FACE DETECTED" in white, accompanied by a yellow warning icon. Below the banner, the page title is "Quiz Beneran Masuk Nilai". On the left, a sidebar shows "Question 1" with the status "Not yet answered" and "Marked out of 1.00". The main content area displays a question about quantum superposition and a text input field for the answer. In the bottom right corner of the main area, there's a small video feed from an "Exam Brother Monitor" camera, showing a person's face. The entire screenshot is framed by a thick red border.

Alerts shown to students have been redesigned for better visibility and impact. The previous version displayed small, static alerts that were easy to miss. The new version expands the alert into a large red notification covering the entire screen for a short period of time, ensuring that students clearly understand the warning and cannot ignore it. This improves the effectiveness of the alert system during exams.



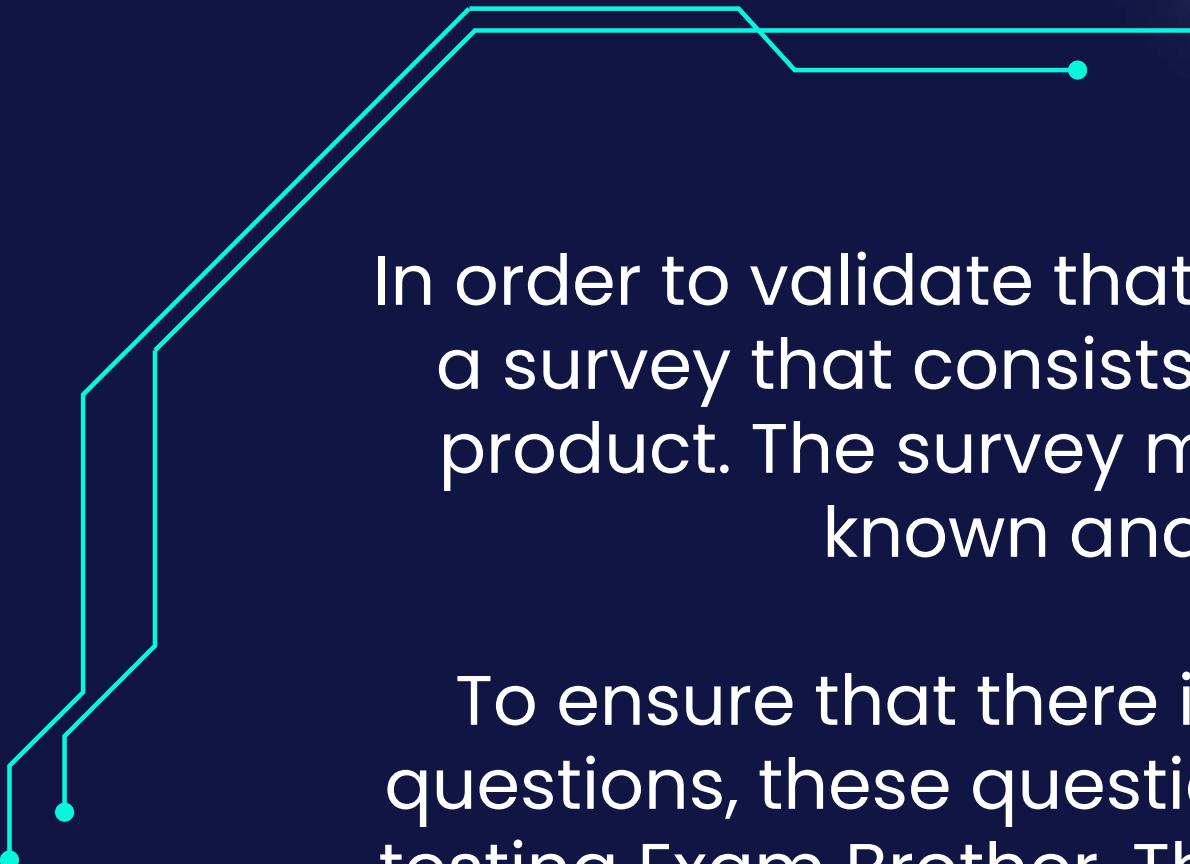
HOW INTEGRATED WITH MOODLE'S QUIZ?

The screenshot shows a Moodle quiz interface. At the top, it says "Test Course / General / Quiz Beneran Masuk Nilai". Below that is the title "Quiz Beneran Masuk Nilai". A "Back" button is visible. On the left, there's a sidebar for "Question 1": "Not yet answered" and "Marked out of 1.00". A "Flag question" link is also present. The main area contains a question: "Superposisi kuantum berarti keadaan sistem dapat berupa kombinasi ... dari beberapa keadaan eigen." Below the question is an "Answer:" input field and a "Finish attempt ..." button. To the right of the answer field is a camera feed window titled "Exam Brother Monitor". The camera feed shows a black screen. Above the camera feed is a "Quiz navigation" box with "1" and "Finish attempt ..." buttons. A small question mark icon is at the bottom of the camera feed window.

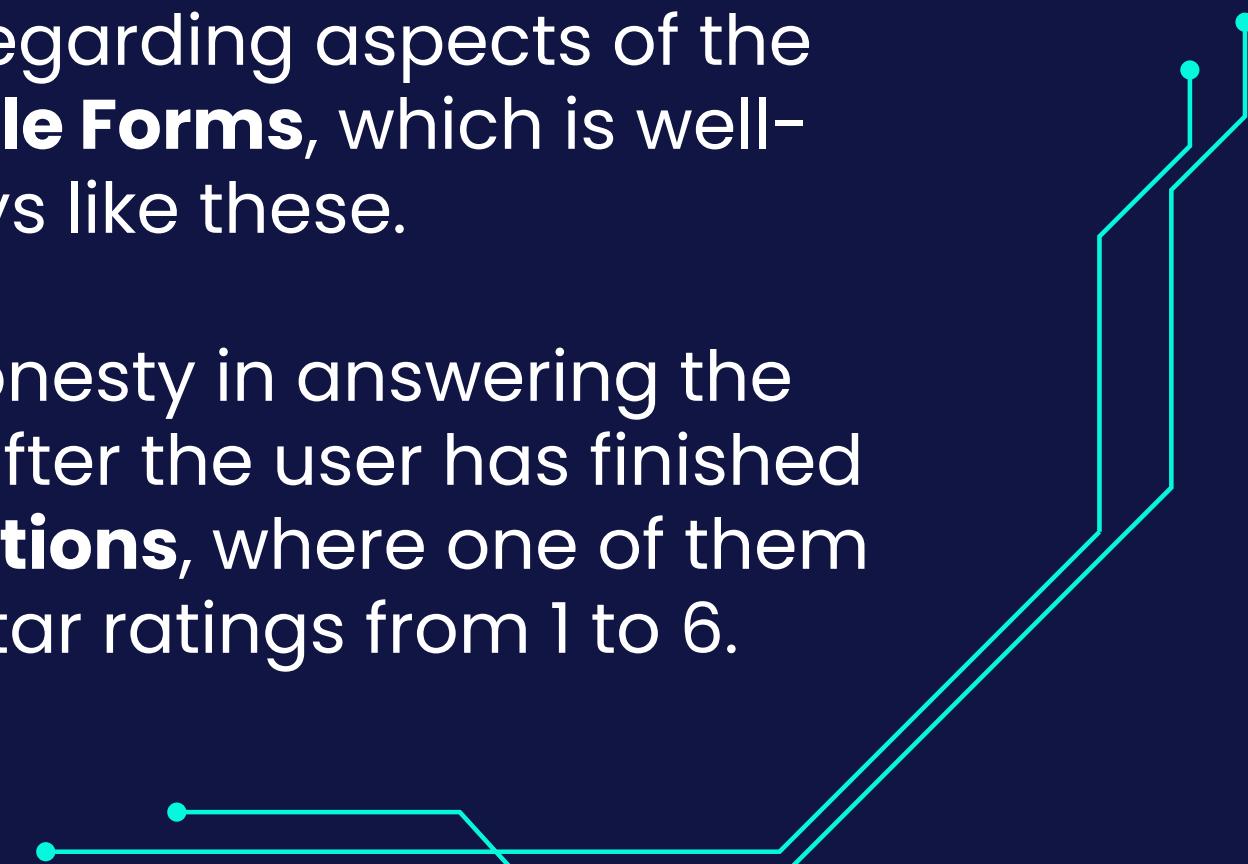
Students will do their exam with their camera on to be monitored by proctors. If there are misconducts, then alerts will be generated to them and also to proctors.



USER VALIDATION TESTING



In order to validate that our team has built the right product, we devised a survey that consists of multiple questions regarding aspects of the product. The survey media provided by **Google Forms**, which is well-known and easy-to-use for surveys like these.



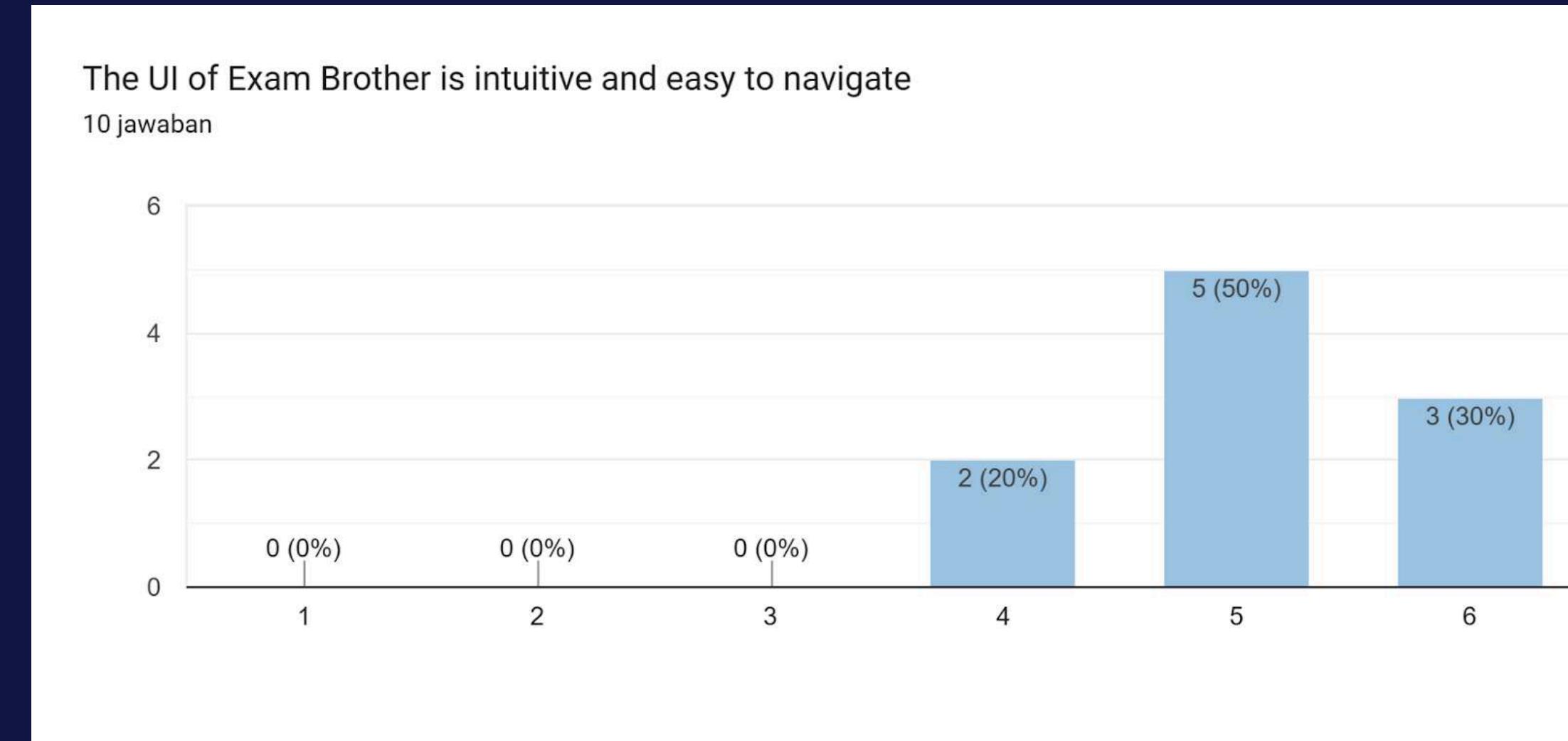
To ensure that there is less bias and more honesty in answering the questions, these questions are asked directly after the user has finished testing Exam Brother. There are **2 types of questions**, where one of them is a short paragraph, and 6 in the form of star ratings from 1 to 6.





UI DESIGN

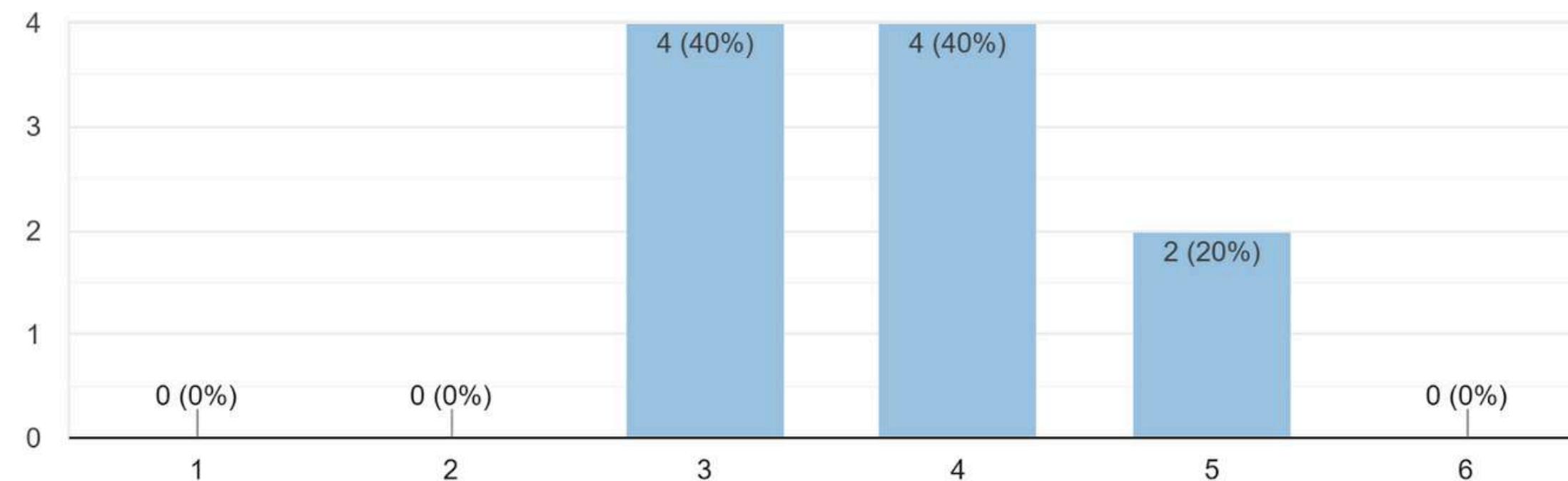
Average: 5.1 / 6.0





DETECTION CAPABILITY

The AI detection system is reliable and there were no false positive happened when you tried Exam Brother
10 jawaban

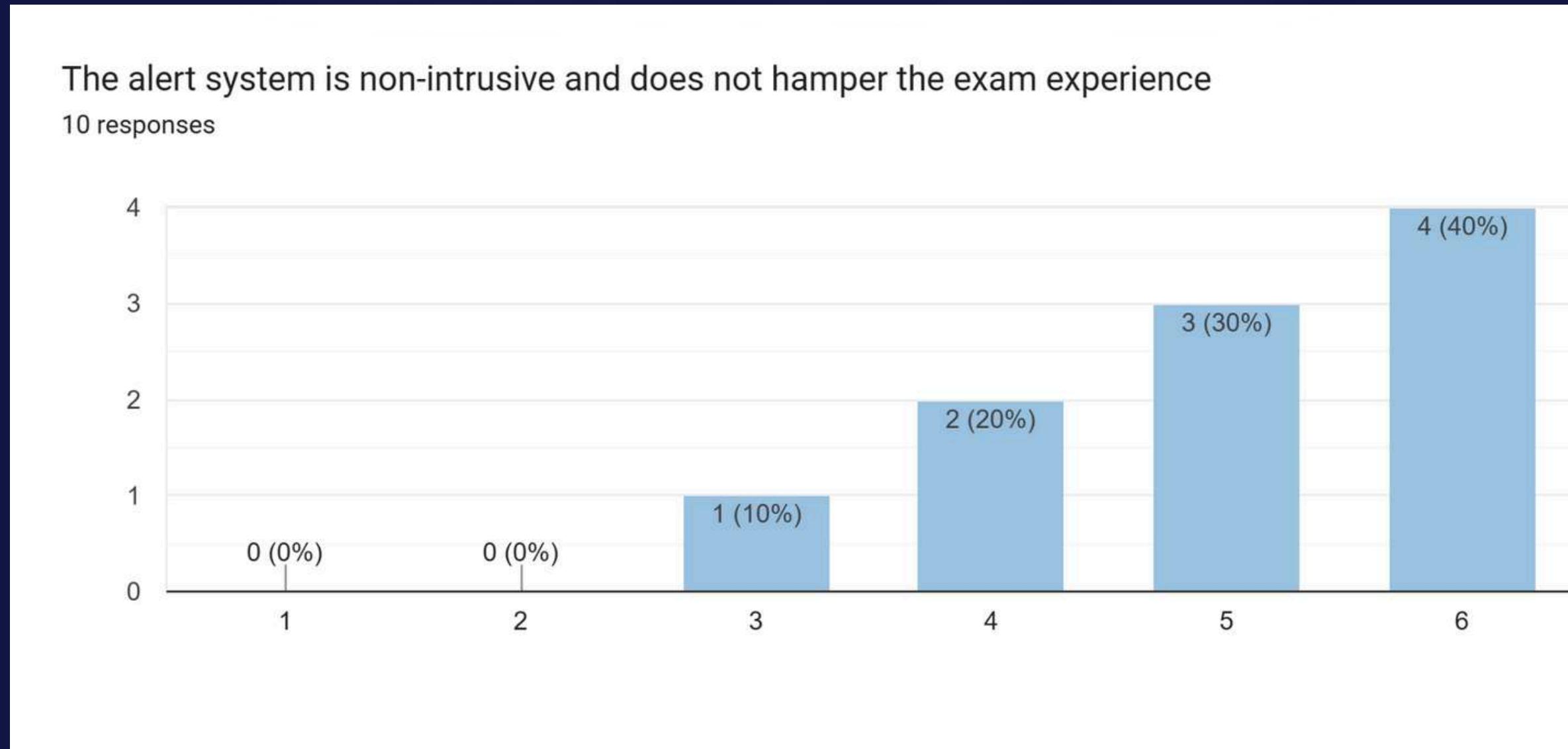


Average: 3.8 / 6.0





ALERT SYSTEM

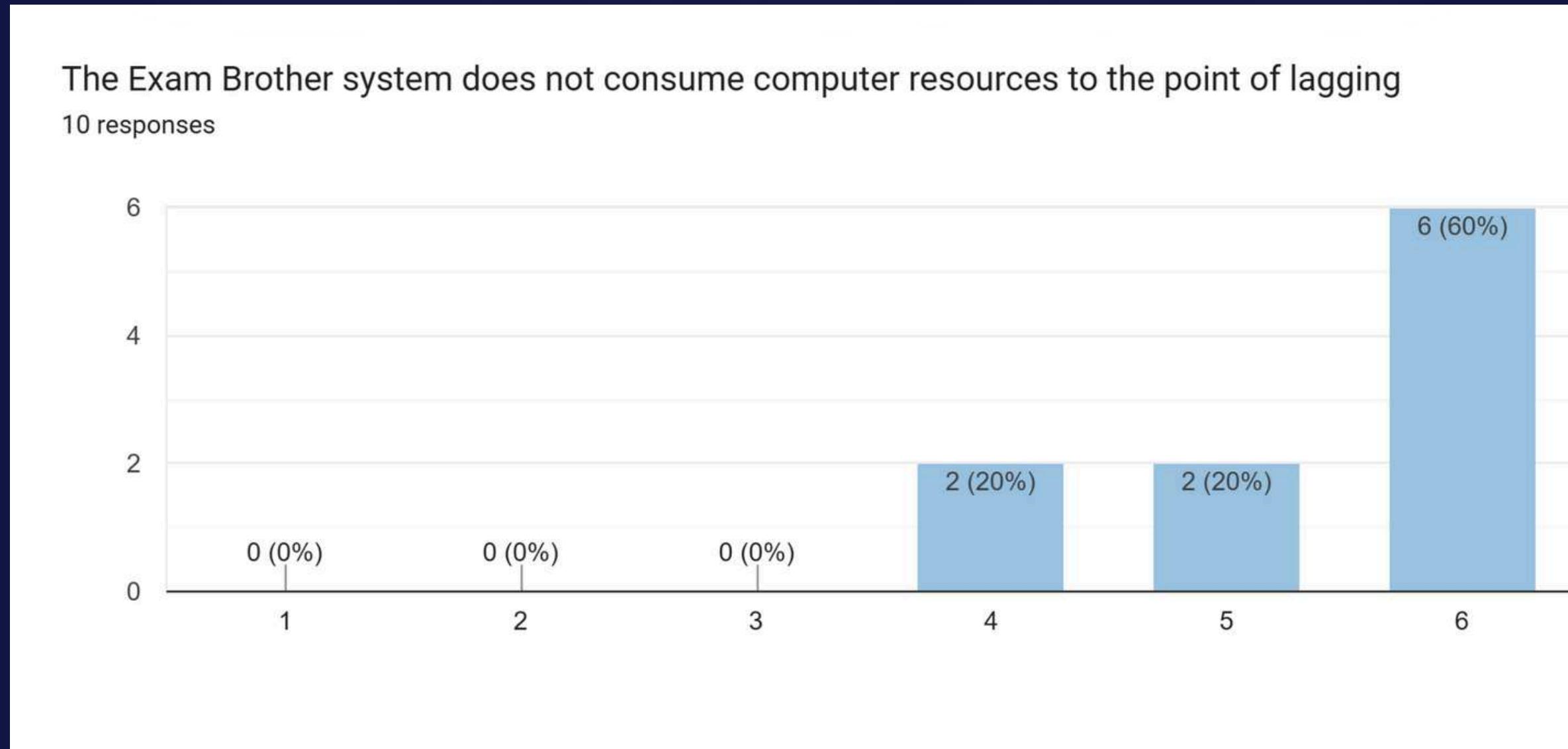


Average: 5.0/6.0





RESOURCE USAGE

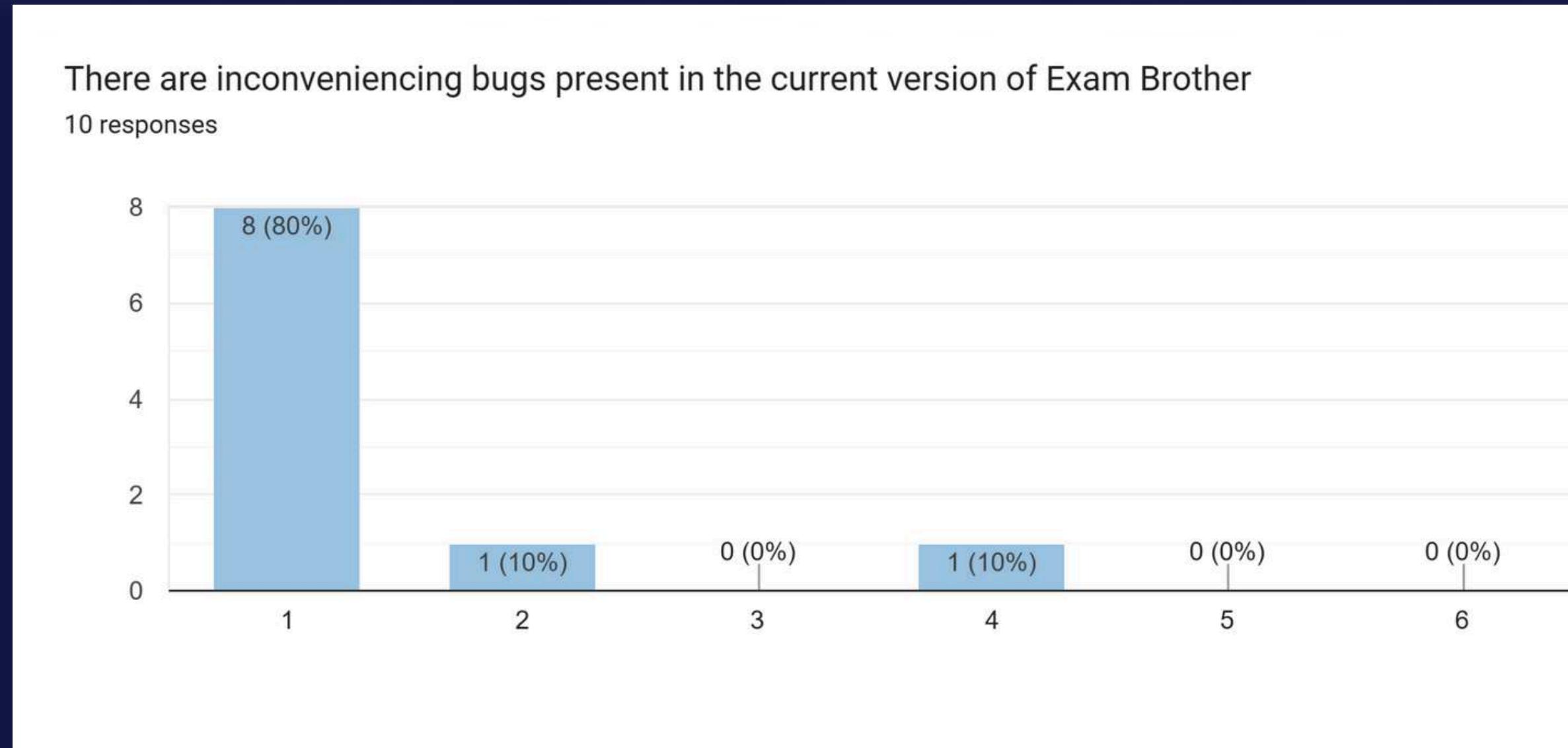


Average: 5.4/6.0





AMOUNT OF SMALL BUGS

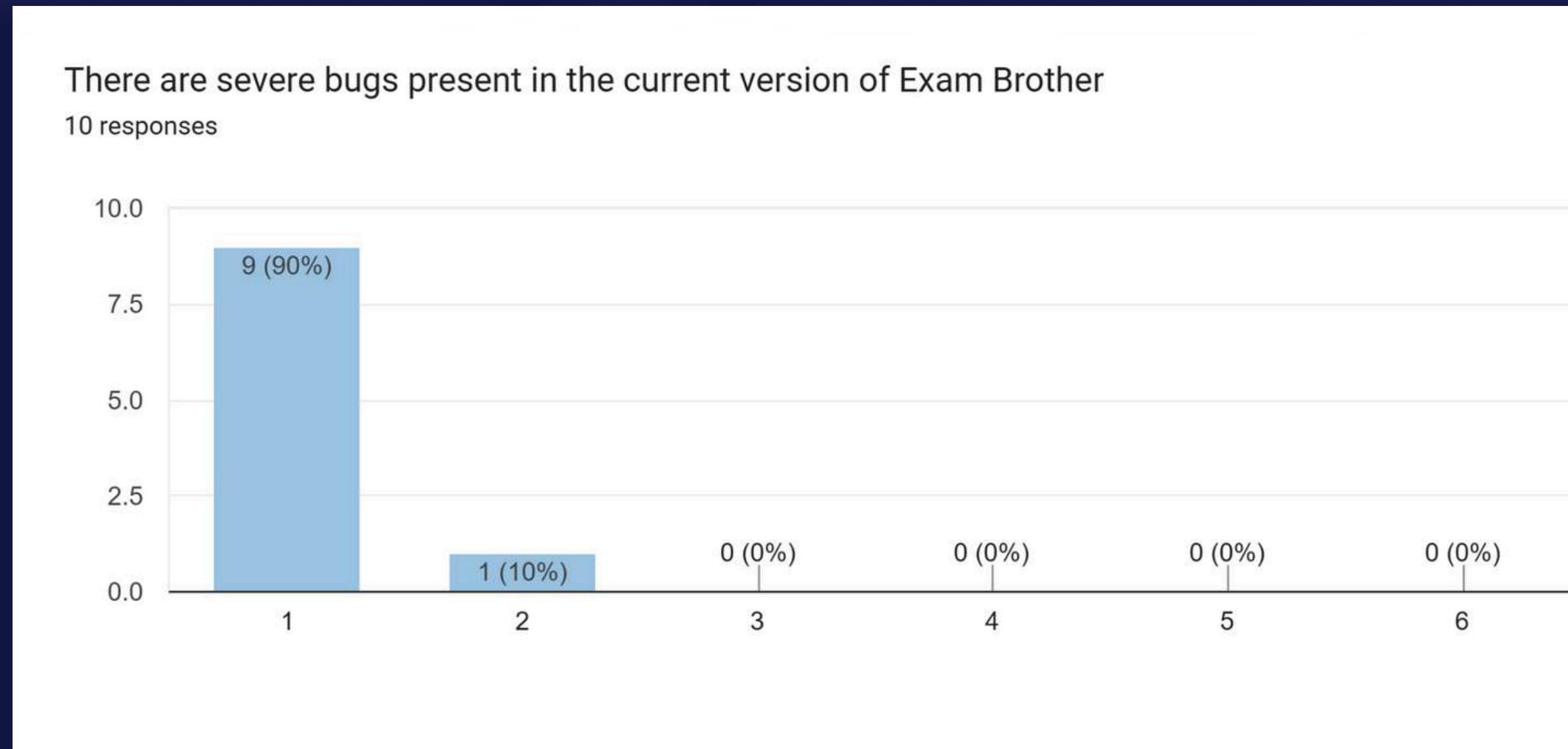


Average: 1.4/6.0





AMOUNT OF SEVERE BUGS



Average: 1.1/6.0





SURVEY FEEDBACK

Any additional feedbacks are welcome. Please write them here if you have any additional feedback to give. If you have complaints and bugs to report, please also write them in this section.

4 responses

UI nya dicakepin. Nengok bawah masih tidak terdeteksi

None

tolong dikasih manualnya

It's so great





THANK YOU

