



EXAM BROTHER

by Group 4 RPL





I 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 innacurate test results.

Continous 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



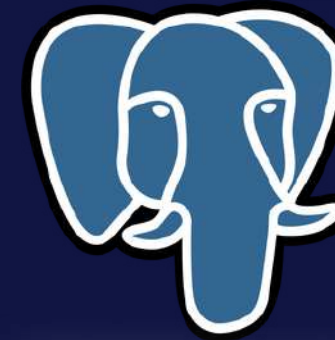
JAVASCRIPT



FIGMA



POSTGRESQL



TRELLO



VS CODE



GITHUB





II PROJECT MANAGEMENT

MEET OUR TEAM



Maxwell Zefanya Ginting
2306221200



Bryan Herdianto
2306210885



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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**

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- Creating APIs for communication to database

TRELLO MANAGEMENT

The screenshot displays the Trello web interface. At the top, there's a navigation bar with a search bar, a 'Create' button, and user profile icons. The main area shows a project board titled 'Research Software'. On the left is an 'Inbox' sidebar with a list of tasks: 'Build basic exam page with webcam access (with consent)', 'Create AJAX handler to log events to Moodle DB.', and 'Write unit test for event logging function.' The main board has three columns: 'Backlog', 'Sprint Backlog', and 'In Progress'. Each column contains cards with user stories or tasks. For example, the 'Backlog' column has cards about exam page navigation, real-time alerts, and post-exam reports. The 'Sprint Backlog' column has cards for 'Create database schema' and 'Set up Moodle plugin structure'. The 'In Progress' column has cards for 'Download Moodle on local' and 'Style the exam interface to match Moodle's default theme and ensure responsive layout.' At the bottom, there's a navigation bar with buttons for 'Inbox', 'Planner', 'Board', and 'Switch boards'.

Navigation Bar:

- Search bar
- Create button
- User profile icons (BH, ?)

Project Board: Research Software

Columns:

- 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.
- Sprint Backlog:**
 - Create database schema.
 - Set up Moodle plugin structure.
- In Progress:**
 - Download Moodle on local.
 - Style the exam interface to match Moodle's default theme and ensure responsive layout.

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.

Bottom Navigation:

- Inbox
- Planner
- Board
- Switch boards

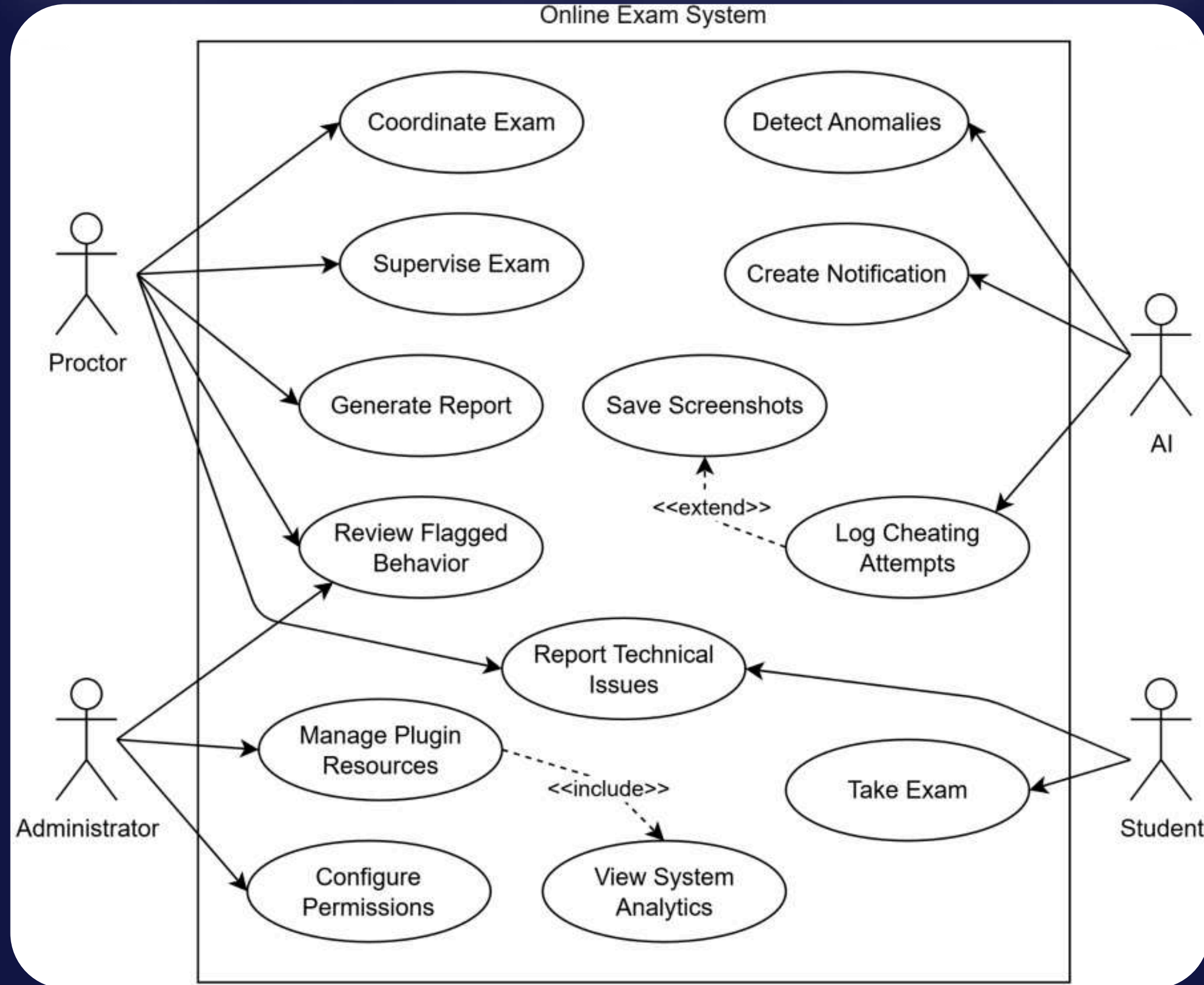
www.pearsoned.com.au



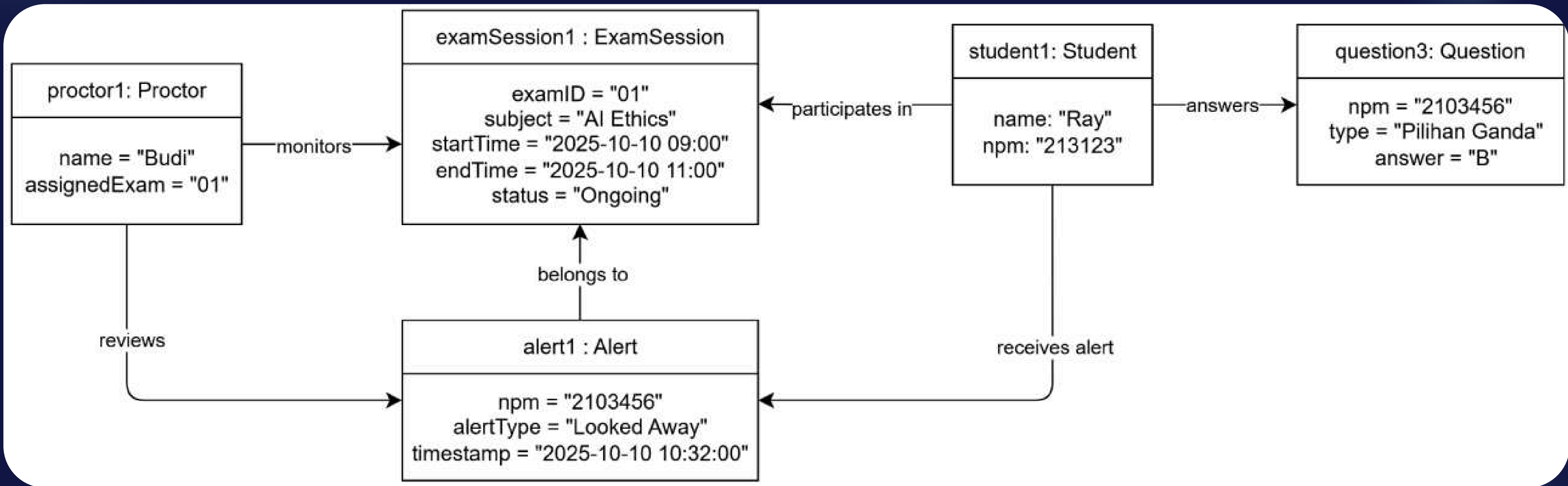


III DESIGN AND UML

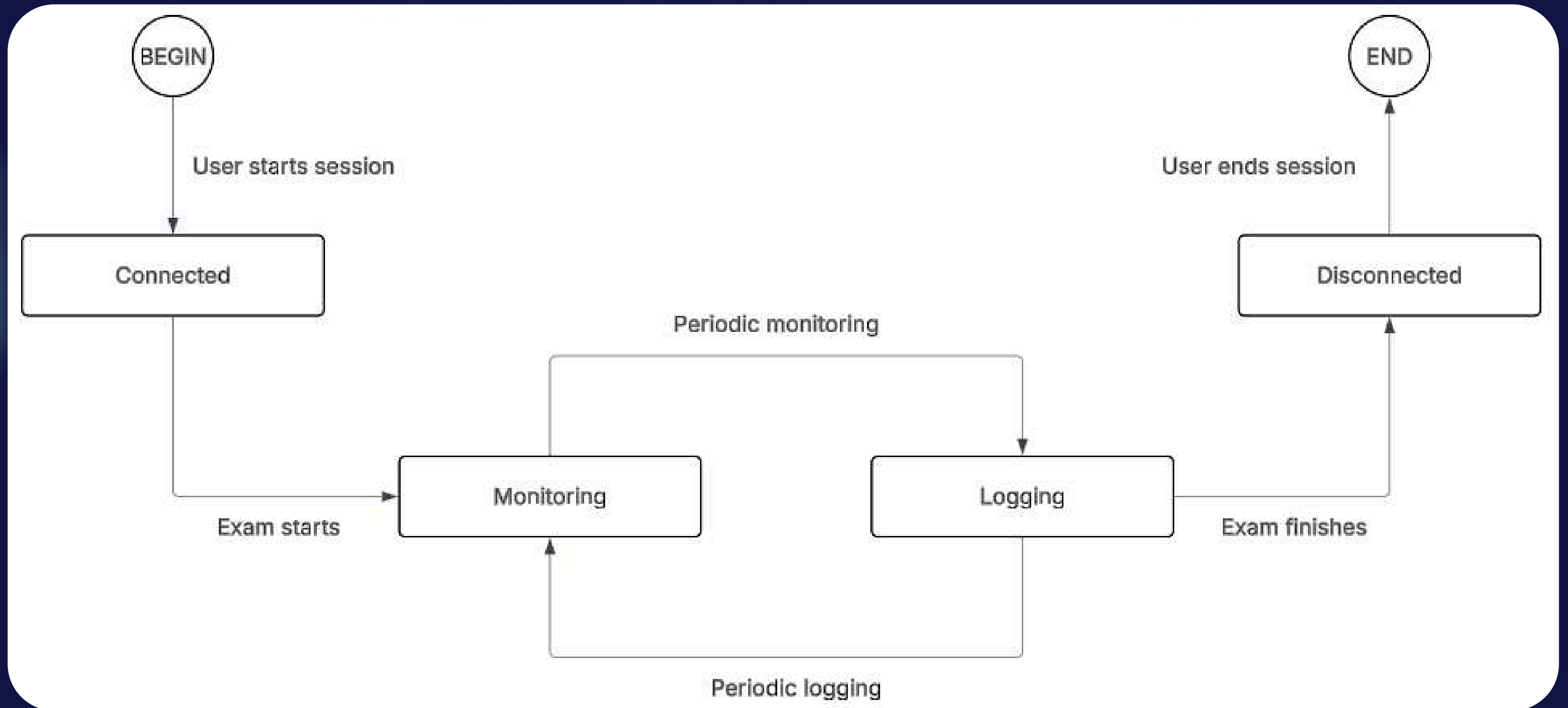
USE CASE DIAGRAM



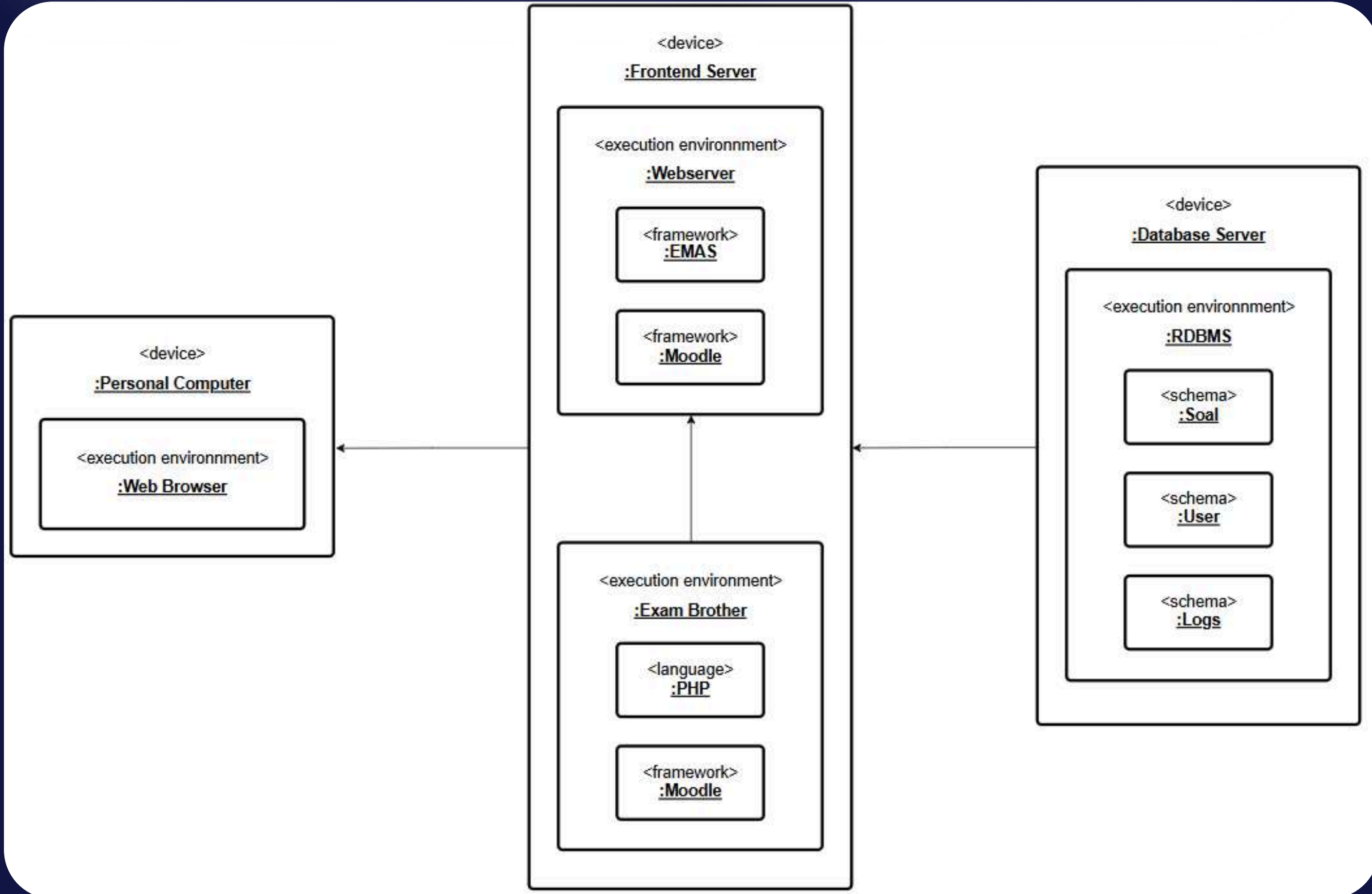
OBJECT DIAGRAM



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.

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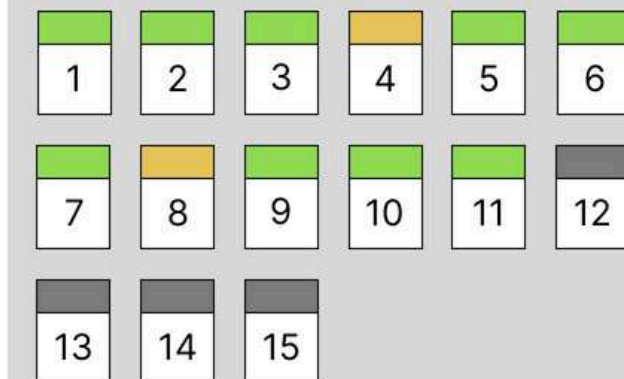
Previous Question

☐ Mark This Question

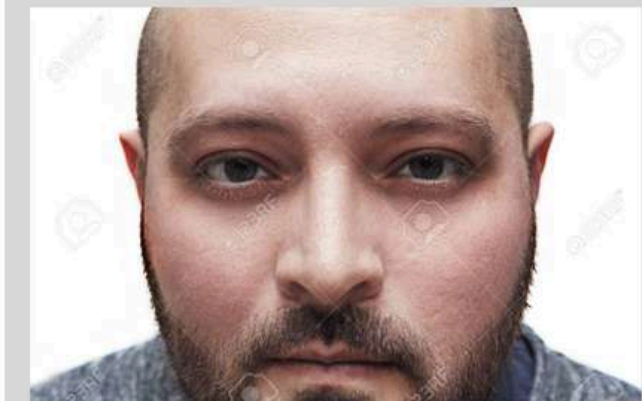
Next Question

Time remaining

⌚ 00:15:10



Camera Preview



DESIGN PROTOTYPE



REAL-TIME ALERT

Cheating status: Cheating Detected: You're looking left



Cheating status: Cheating Detected: You're looking right



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"/>									





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

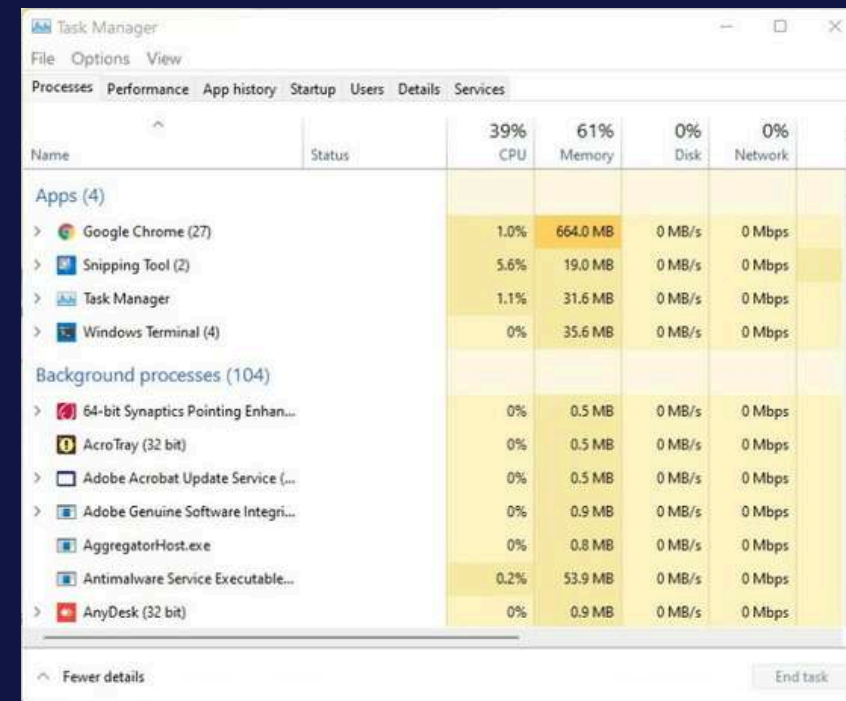
Previously tested components of the Exam Brother system will be re-evaluated

ACCEPTANCE TESTING

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



TESTING TOOLS



TASK MANAGER



MICROSOFT EDGE



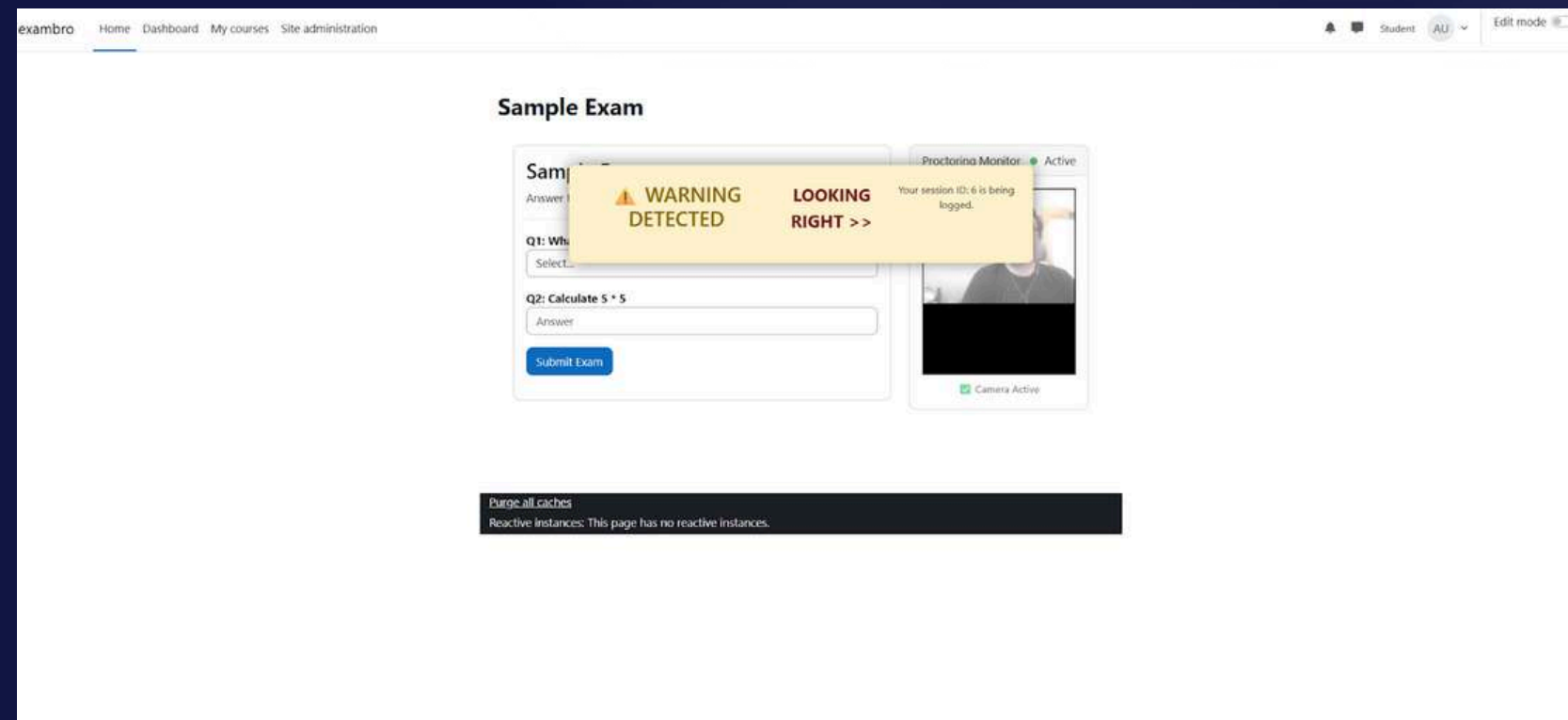
PHPUNIT



CHROME BROWSER

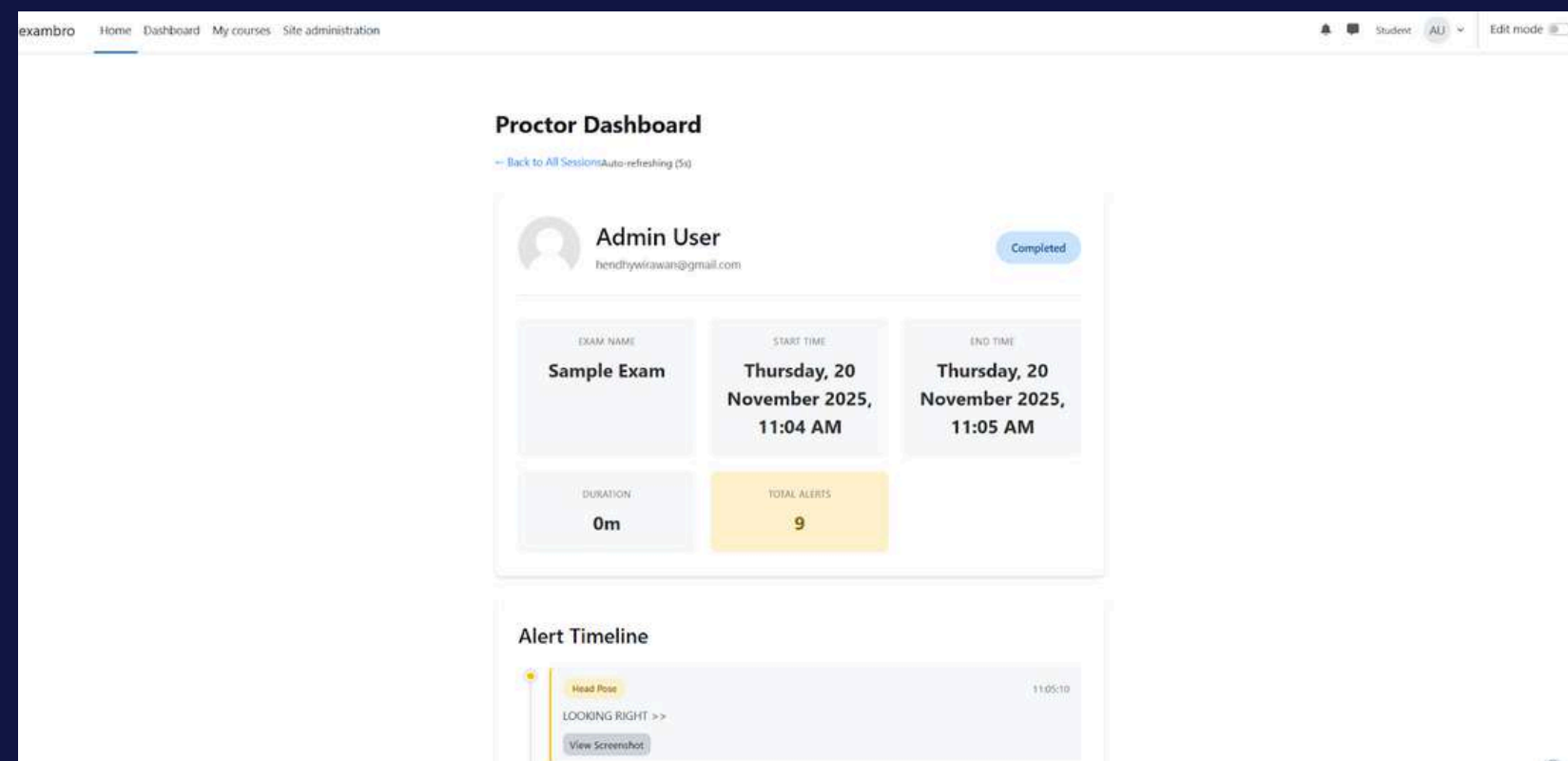


TARGET AREAS



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



exambro Home Dashboard My courses Site administration Student AU Edit mode

Proctor Dashboard

Exam History

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	View Details
Admin User	Sample Exam	20 Nov, 09:17	20 Nov, 09:18	0 min	Completed	5	View Details
Admin User	Sample Exam	20 Nov, 09:12	20 Nov, 09:14	1 min	Completed	10	View Details
Admin User	Sample Exam	5 Nov, 18:55	20 Nov, 09:12	21016 min	Completed	0	View Details
Admin User	Sample Exam	5 Nov, 18:54	5 Nov, 18:55	0 min	Completed	0	View Details

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

POST-EXAM REPORTS

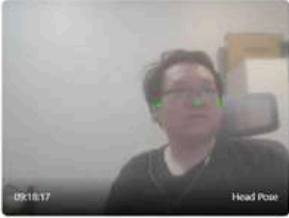


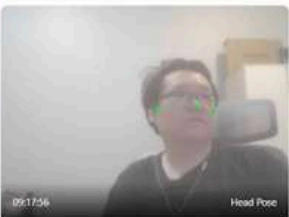
After the exam ends, proctors can see reports of all the students. If the student was marked suspicious, the proctor can then see the details.

exambro Home Dashboard My courses Site administration Student AU Edit mode

[View screenshot](#)

Head Pose
LOOKING RIGHT >>
[View Screenshot](#) 09:17:51

Screenshots (5)

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

CHEATING ATTEMPT LOG

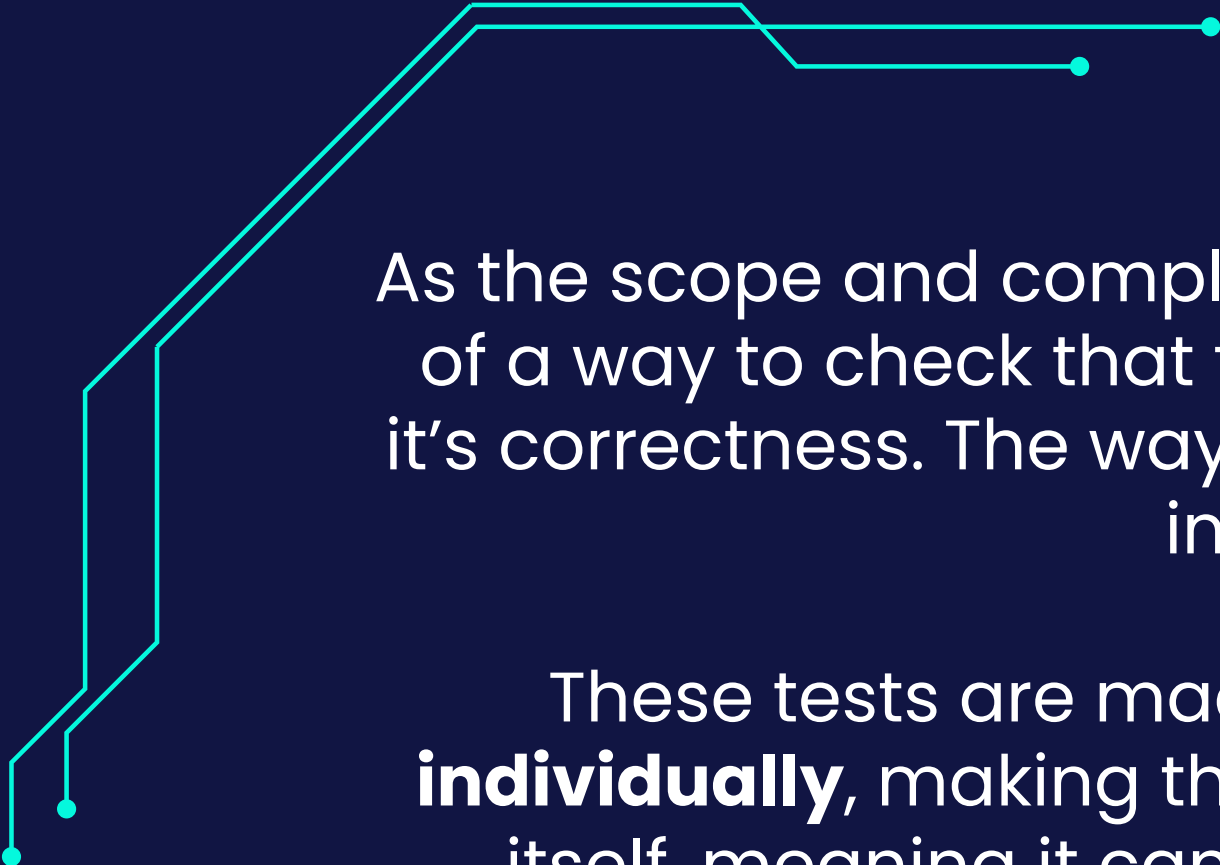
Proctors can see the details of students who have been recorded attempting to cheat. These details are timestamp and screenshot.





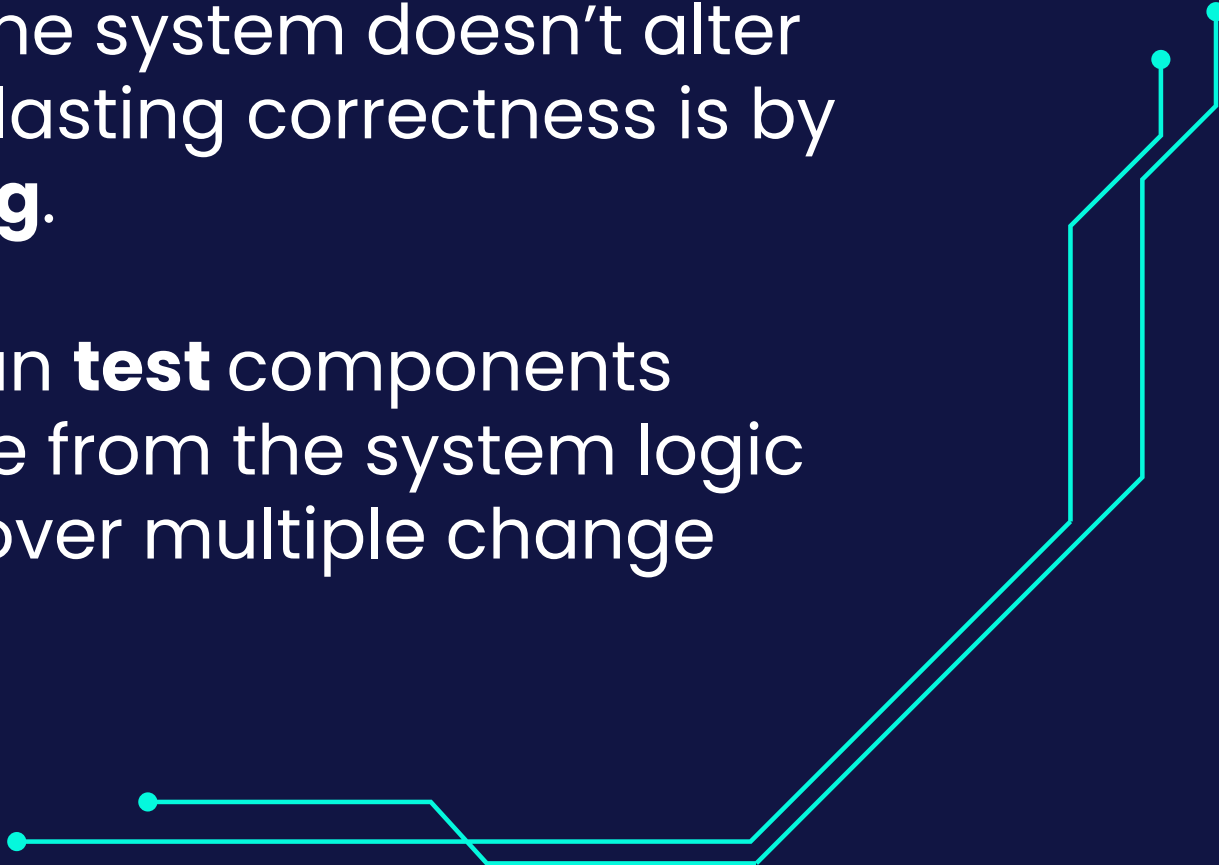



UNIT TESTING



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.

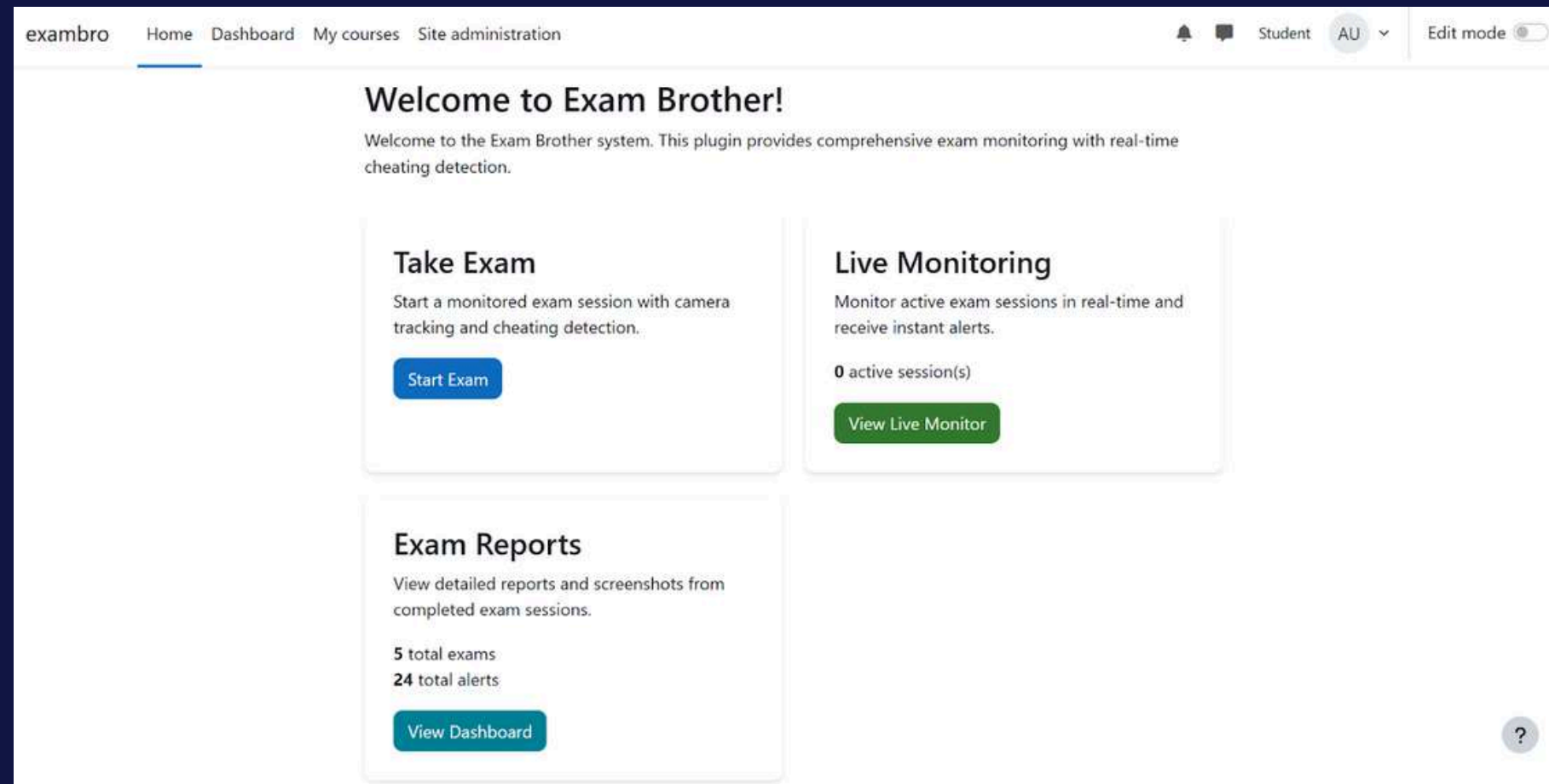
Severity_2

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



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.

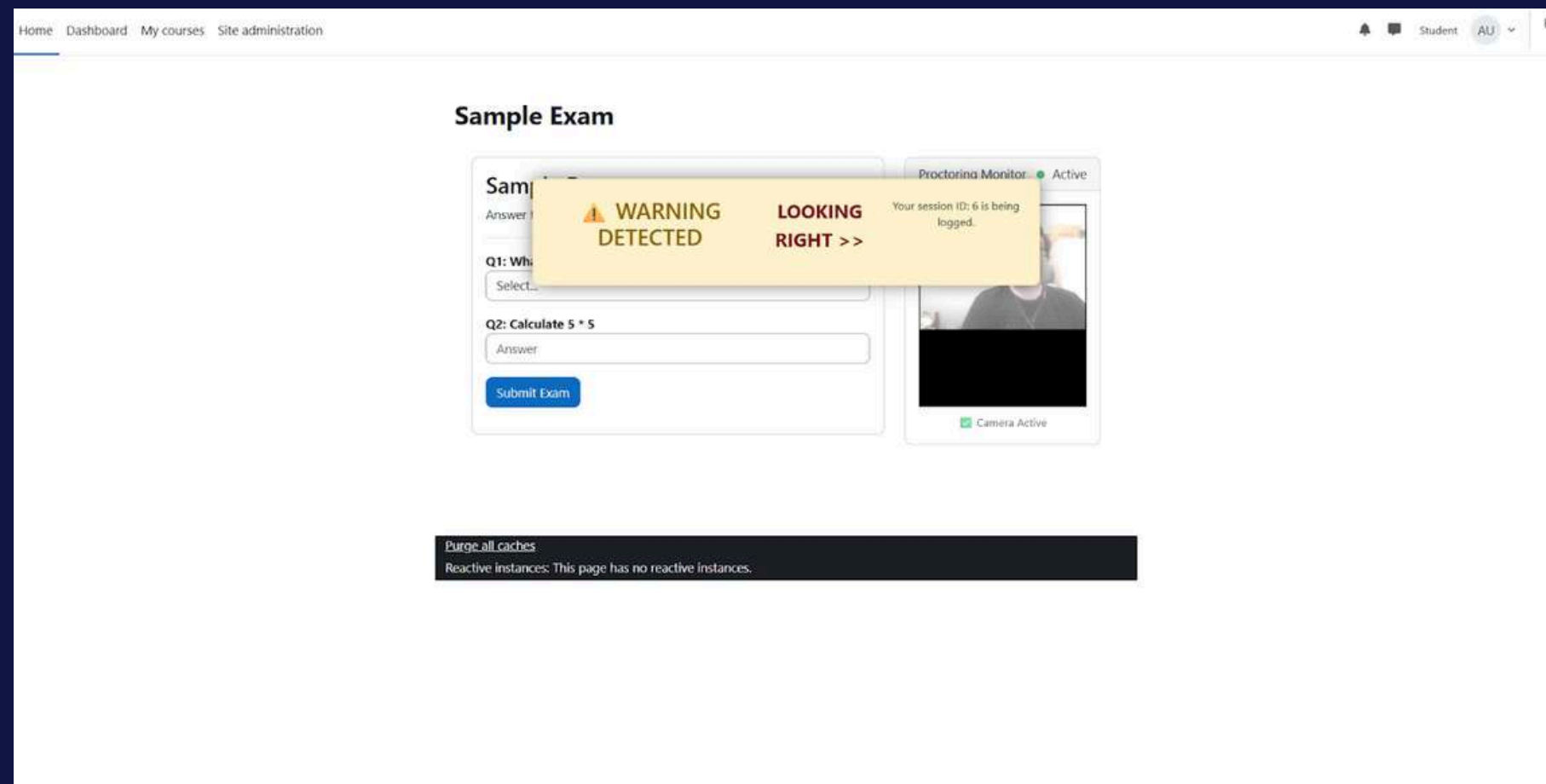




PERMANENT ALERT

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



Sample Exam

Sample Exam

Answer the following questions:

Q1: What is the capital of France?

Select...

Q2: Calculate $5 * 5$

Answer

Submit Exam

Purge all caches

Reactive instances: This page has no reactive instances.

Proctoring Monitor ● Active

Monitoring user head pose...

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



Last updated: 7:26:18 PM

Refresh Now

☒ Auto-refresh (5s)

 **Bryan Herdianto**
Test Quiz

Active

START TIME:
19:21:13

DURATION:
05:08

ALERTS:
0

Recent Alerts

No alerts

View Details

End Session

Real-time Alerts

15:42:22

Bryan Herdianto: TAB SWITCH DETECTED (3/3)

15:42:11

Bryan Herdianto: TAB SWITCH DETECTED (2/3)

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?



Status: SUCCESS

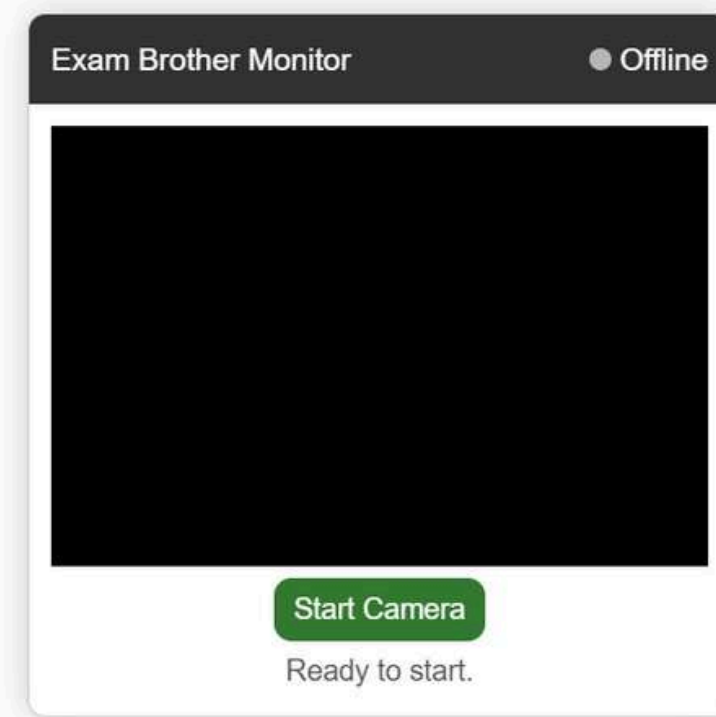
Students can't start the exam if they haven't started their camera. There is a white overlay that blocks them from viewing it. They also can't inspect it to delete the overlay.



Exam Paused

You must start your camera to view the exam questions.

Please click "Start Camera" in the widget.



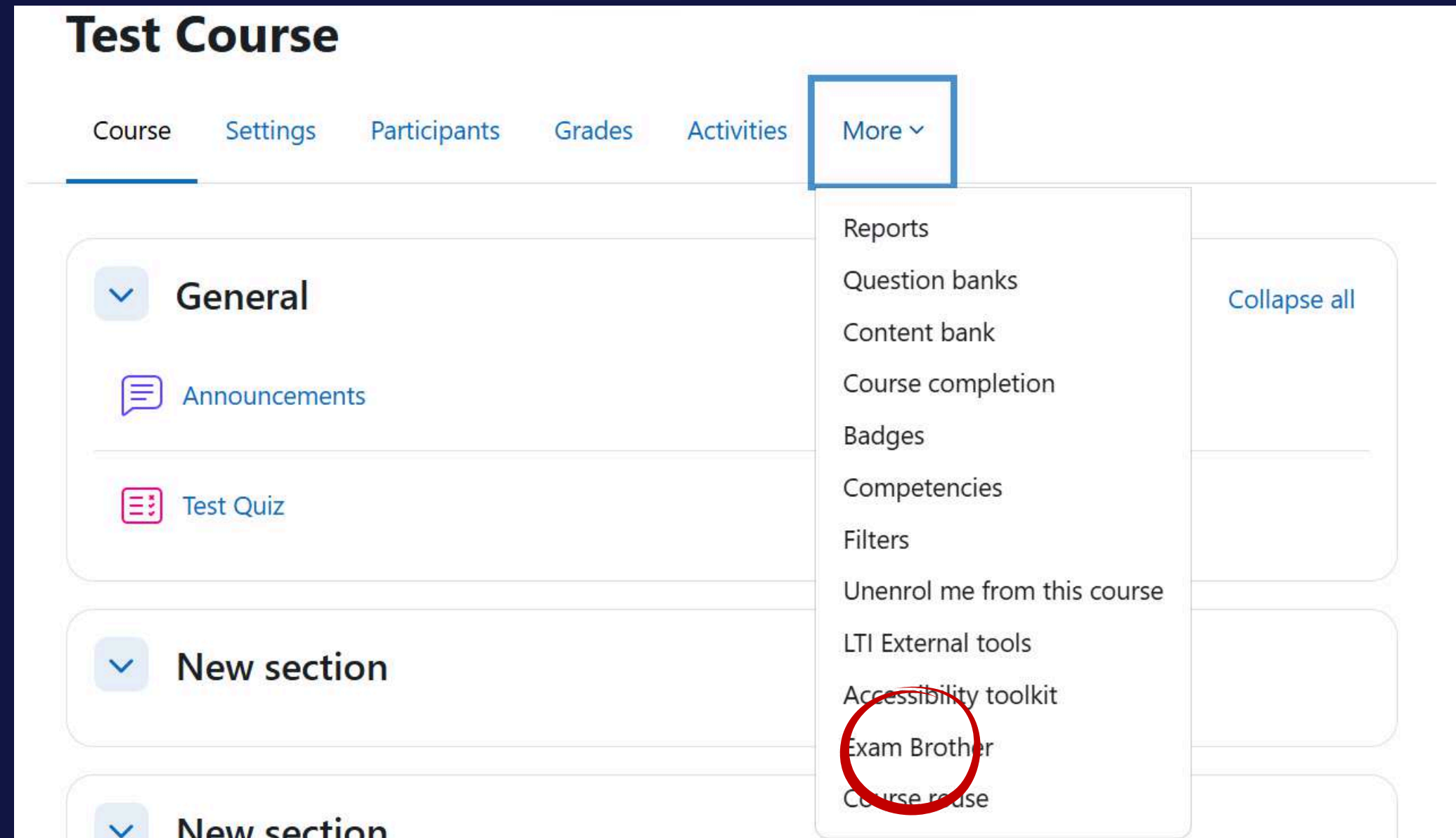
REGRESSION TESTING



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.



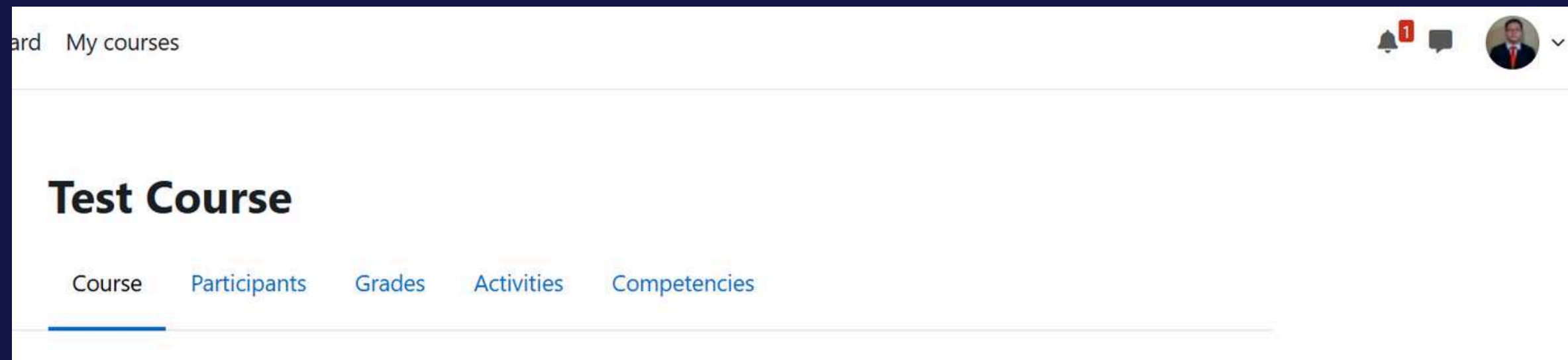
DOES PLUGIN SHOW?



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?



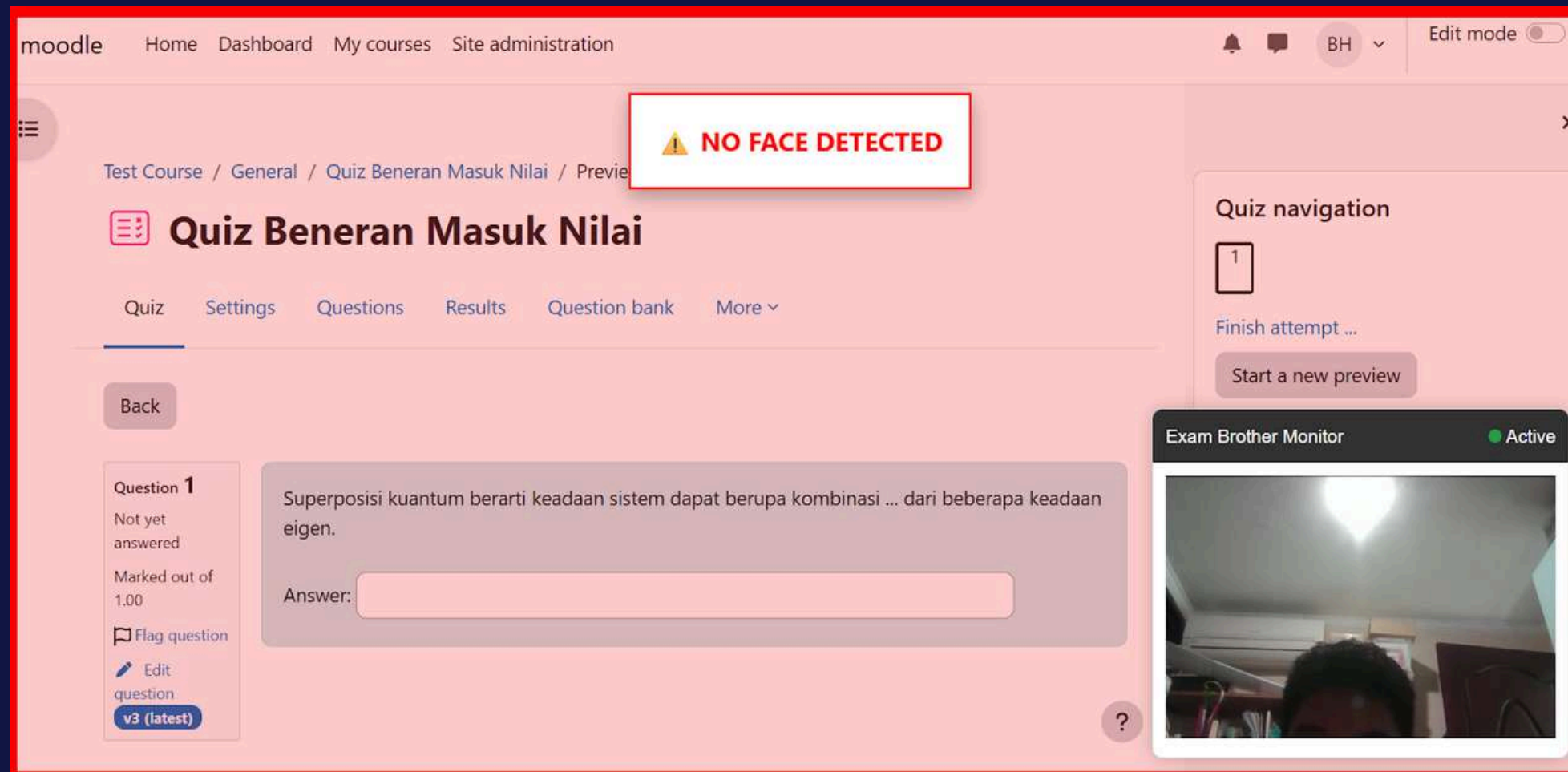
From the student's perspective, they can't access the real-time monitoring and reports from Exam Brother. They can only access the quiz that is integrated with Exam Brother.



REAL-TIME ALERTS



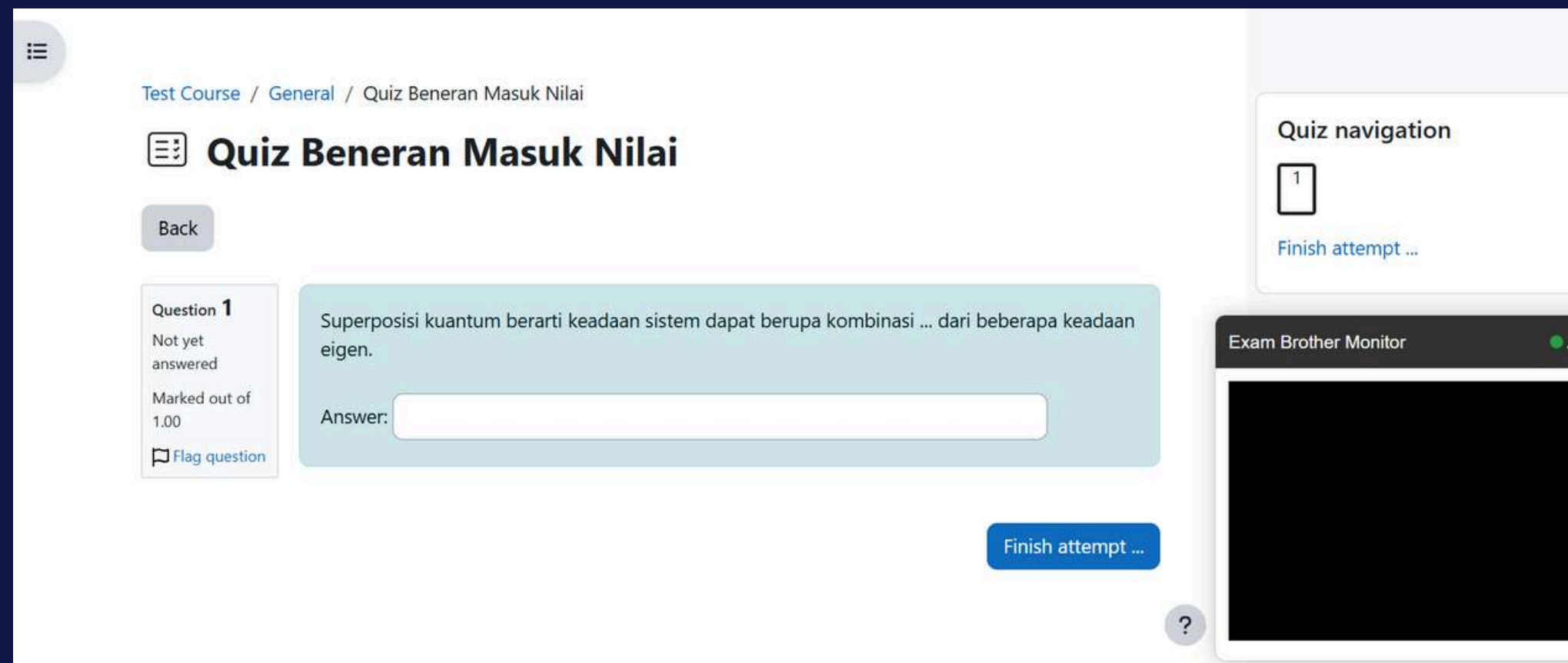
Status: SUCCESS



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?

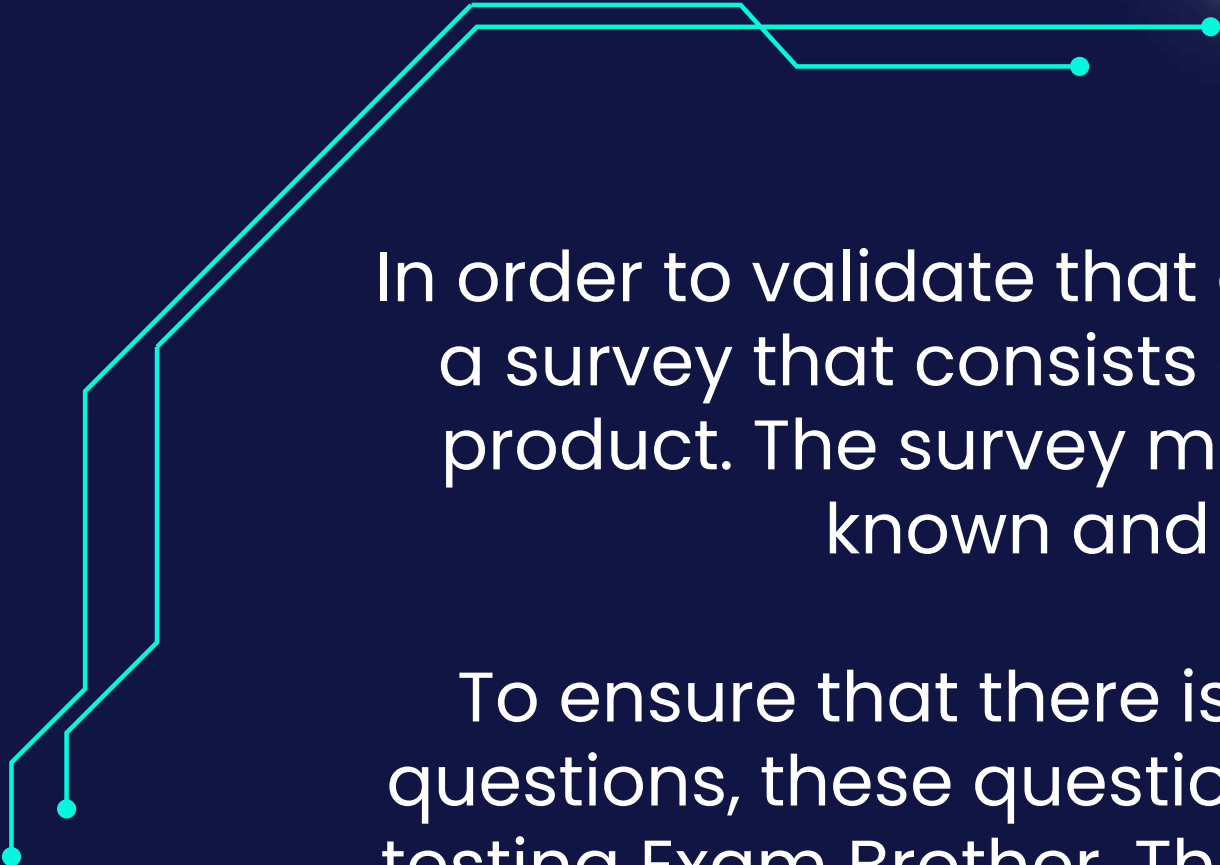


Students will do their exam with their camera on to be monitored by proctors. If there are misconducts, then alerts will be generated to them and also to proctors.




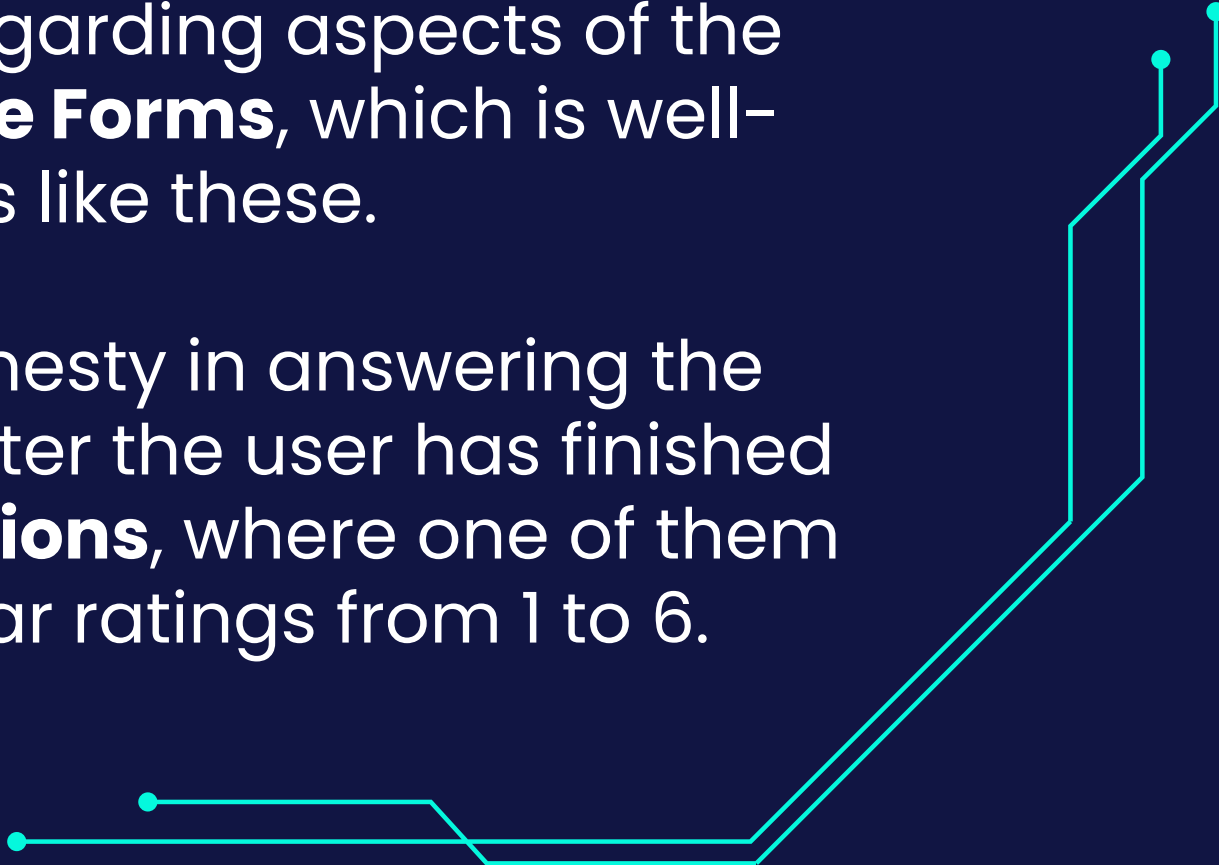


USER VALIDATION TESTING



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.



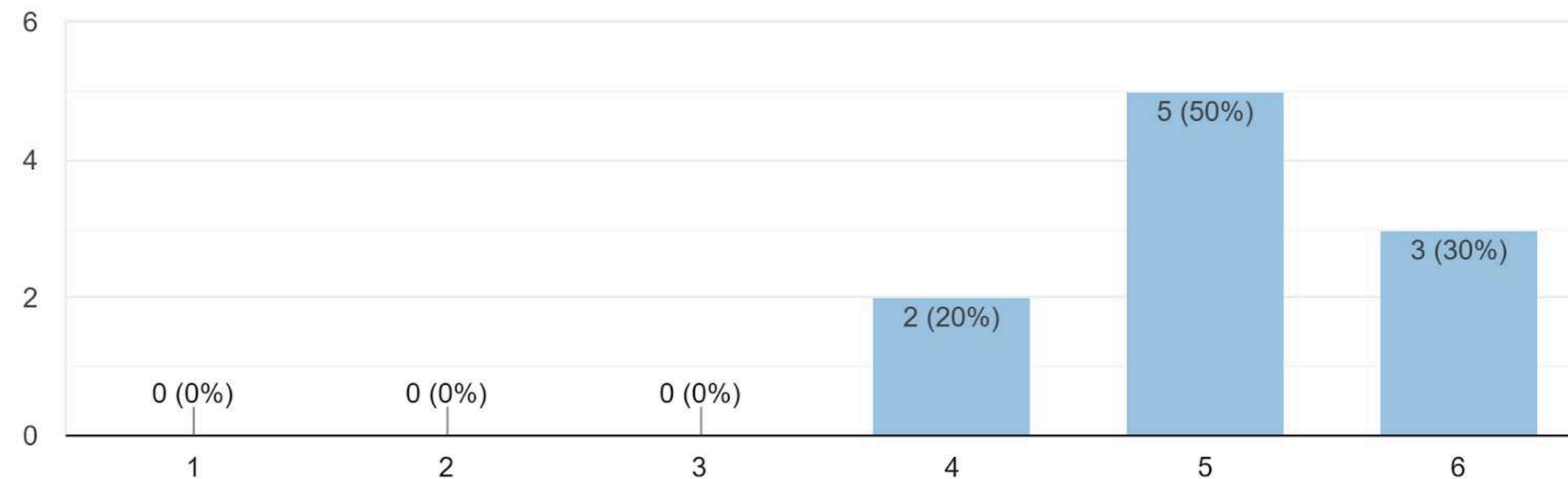
UI DESIGN

Average: 5.1 / 6.0



The UI of Exam Brother is intuitive and easy to navigate

10 jawaban

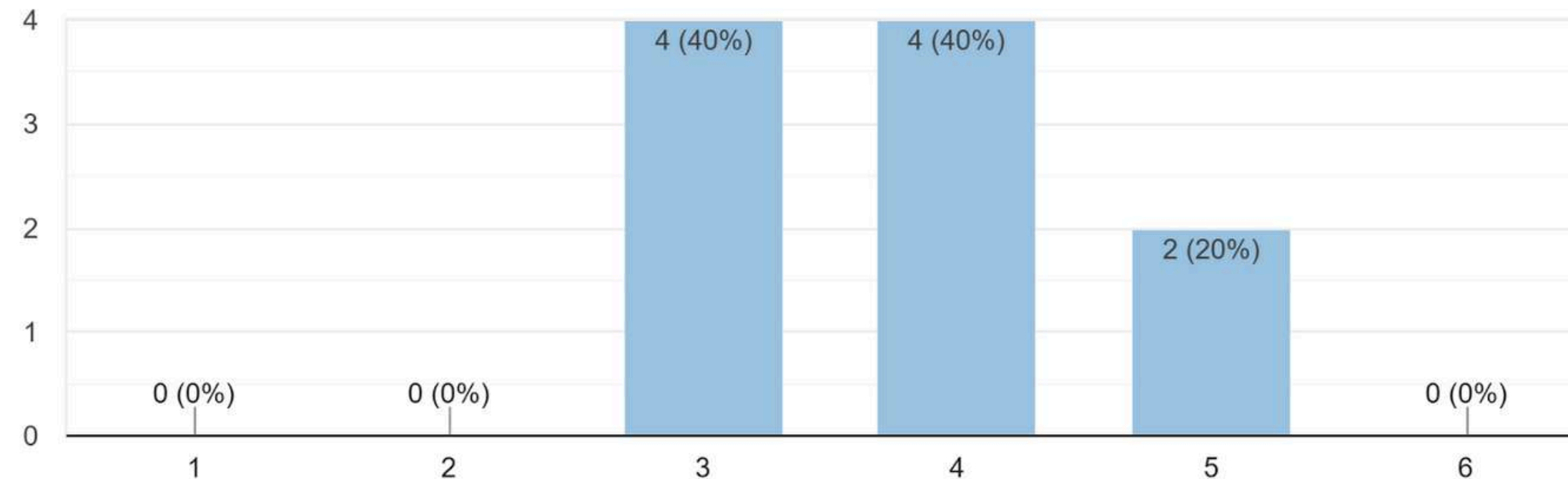


DETECTION CAPABILITY



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

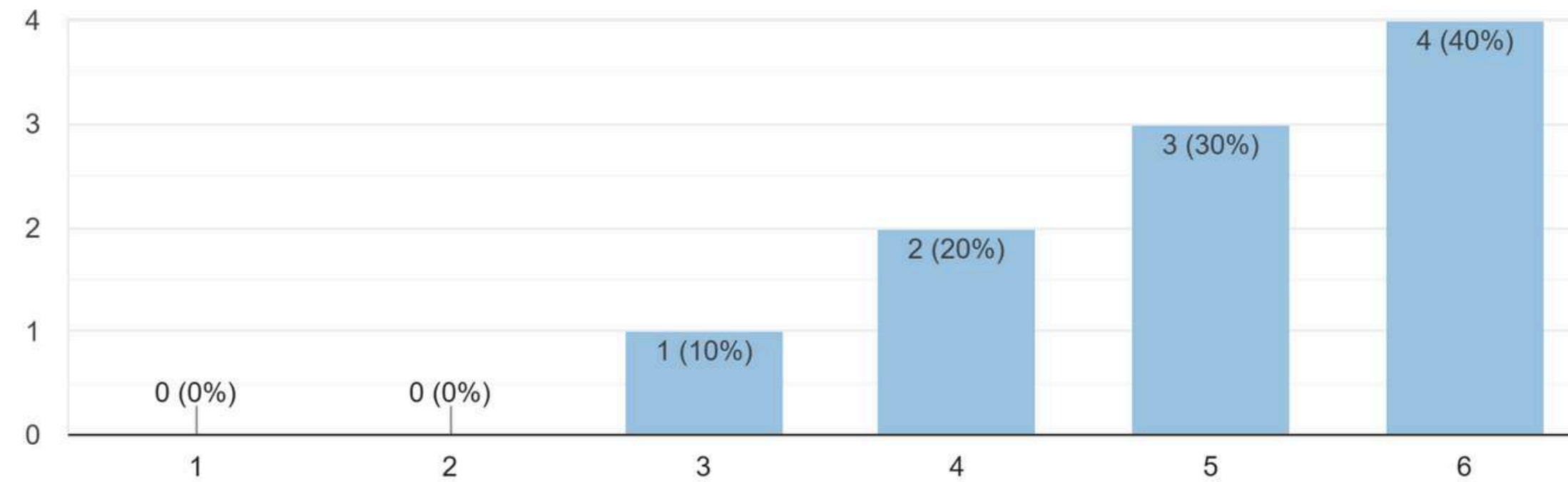


ALERT SYSTEM



The alert system is non-intrusive and does not hamper the exam experience

10 responses



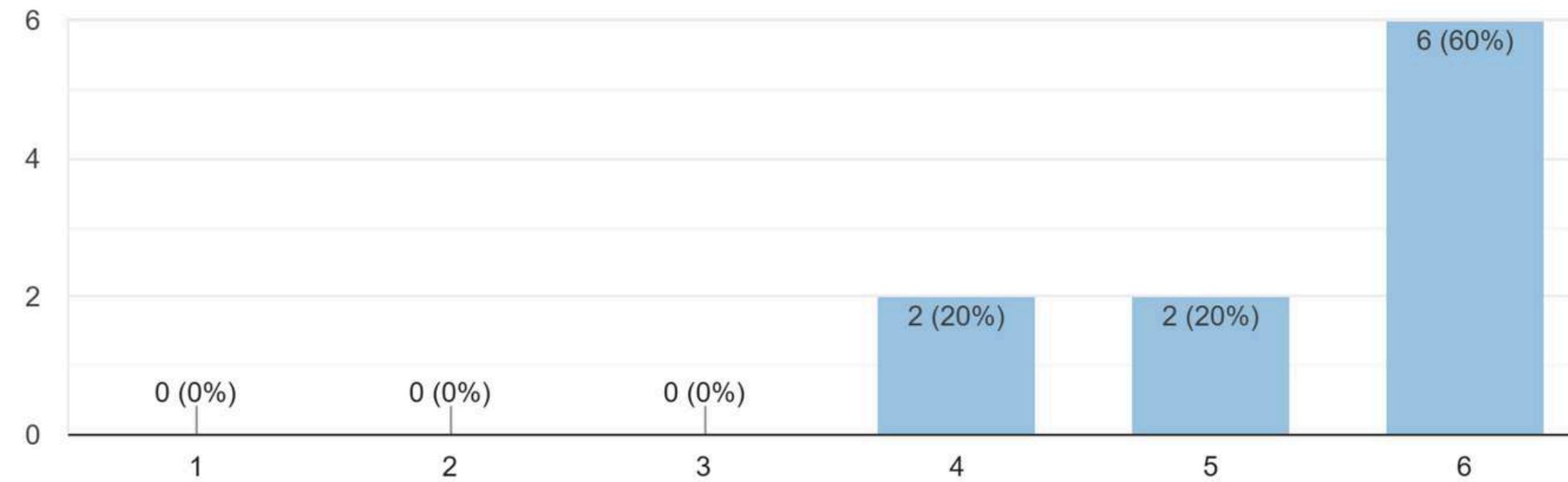
Average: 5.0/6.0



RESOURCE USAGE



The Exam Brother system does not consume computer resources to the point of lagging
10 responses



Average: 5.4/6.0

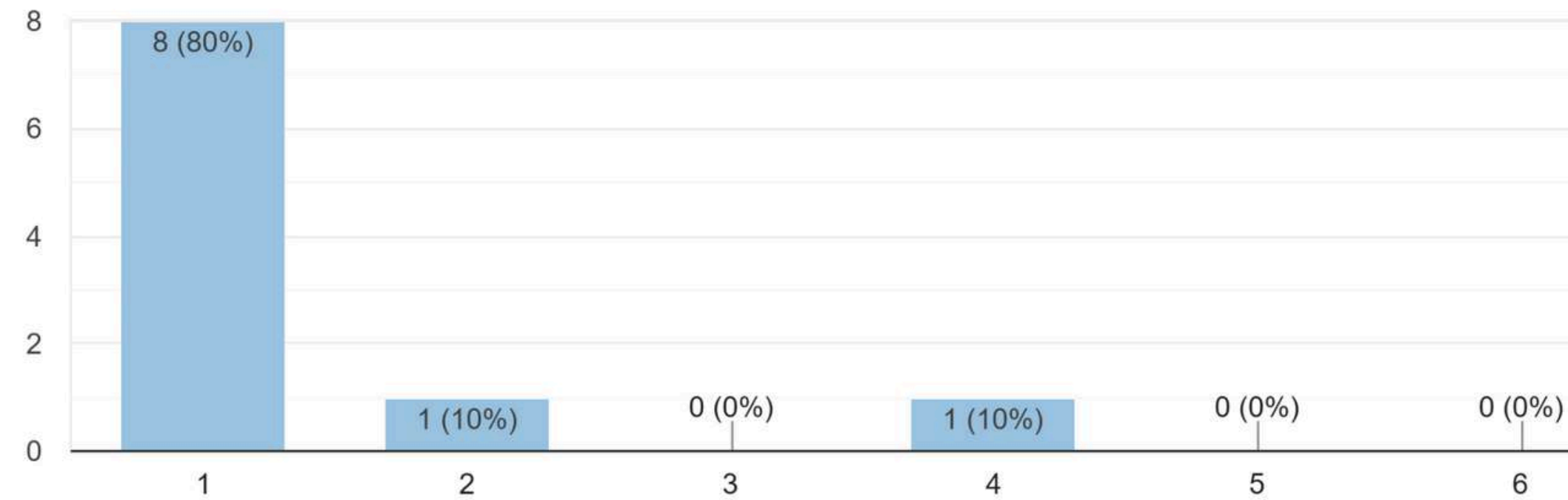


AMOUNT OF SMALL BUGS



There are inconveniencing bugs present in the current version of Exam Brother

10 responses



Average: 1.4/6.0

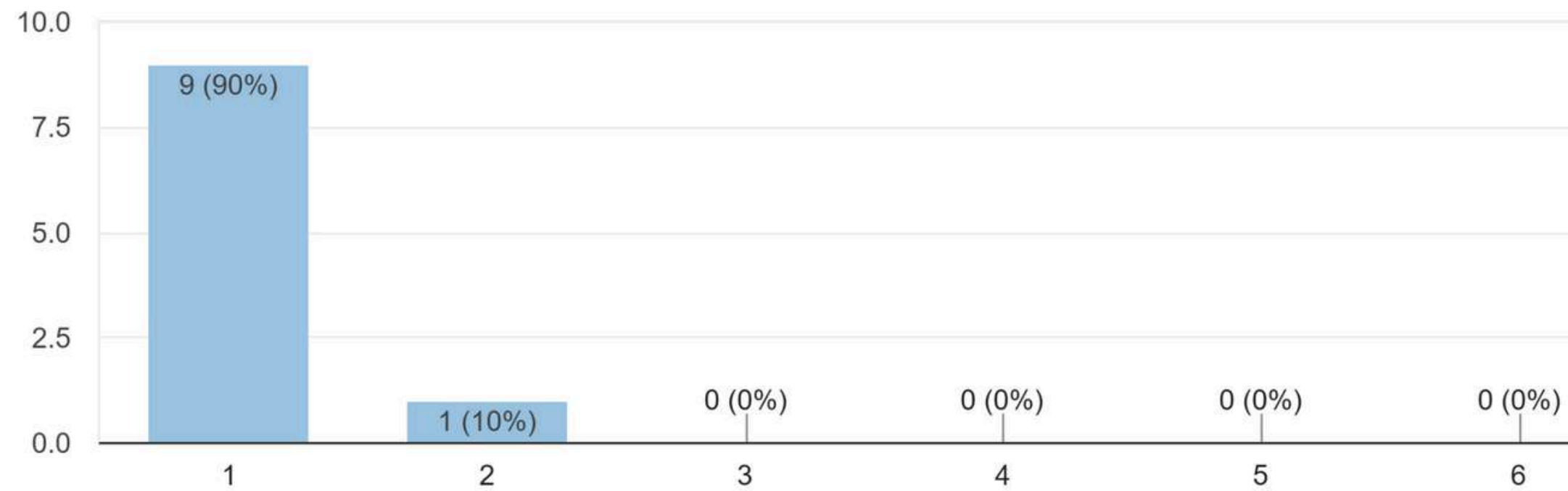


AMOUNT OF SEVERE BUGS



There are severe bugs present in the current version of Exam Brother

10 responses



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

