Team3 – project requirement

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Live Quiz Game

An instructor builds a question set and hosts a live game. Students join from their own devices with a code, get sorted into color groups, and answer as a group in open response. Jev (Typesafe AI) grades each answer against the instructor's reference answer. Points depend on how correct the answer is and how fast the group submitted it.

Priority: E Essential · D Desirable · O Optional Values in ***bold italics*** are proposals the team still needs to confirm.

Glossary

Term	Definition
Instructor	A person with an account who creates question sets and hosts games.
Student	A person who joins a game from their own device. Students have no account.
Question set	A titled, ordered list of questions owned by one instructor.
Question	A prompt (text, an image, or both), a reference answer, and a time limit.
Reference answer	The instructor's open-response answer to a question, used to grade student answers.
Game	One live session that plays a question set with a group of students.
Lobby	The phase of a game after it is created and before groups are assigned, while students are joining.
Game phase	The stage a game is in. The phases are listed in 3.4.
Game PIN	The 6-digit number students enter to join a specific game.

Term	Definition
Group	A set of students in one game who answer questions together and share one score.
Group color	The color and color name that identify a group within a game. Proposed colors: Red, Orange, Yellow, Green, Teal, Blue, Purple, Pink, Brown, Black, White, Gray.
Group answer	The single answer a group submits for a question.
Jev	Typesafe AI, the external service that grades group answers.
Confidence	Jev's estimate, from 0 to 1, of how likely a group answer is to be correct.
Accuracy score	Jev's rating, from 0 to 1, of how completely a group answer matches the reference answer. 1 means a full match.
Verdict	The system's ruling on a group answer, Correct or Incorrect, decided from the confidence (6.3).
Time limit	The number of seconds a question stays open (2.5).
Elapsed time	The number of seconds from when a question opens to when the system receives a group answer.
Leaderboard	All groups in a game ranked by total points.

Functional requirements

1. Instructor accounts

- **1.1** E The system shall allow an instructor to create an account with an email address and a password.
- **1.2** E The system shall require an instructor to log in before creating, editing, or hosting with a question set, or uploading an image.
- **1.3** E The system shall allow students to join a game without creating an account.

2. Question sets

- **2.1** E The system shall allow an instructor to create a question set with a title that is not empty.
- **2.2** E The system shall allow an instructor to add, edit, reorder, and delete questions in a question set that the instructor owns.
- **2.3** E Each question shall have a prompt made of text, an image, or both.
    - **2.3.1** E The system shall reject a question that has neither prompt text nor an image.
    - **2.3.2** E The system shall accept only image files smaller than 25 MB as prompt images.
- **2.4** E Each question shall have a reference answer written as open-response text.
    - **2.4.1** E The system shall reject a question whose reference answer is empty.
- **2.5** E Each question shall have a time limit, set by the instructor, from 30 seconds to 5 minutes. The default shall be ***30 seconds***.
- **2.6** E A question set shall contain from 1 to ***50*** questions.
- **2.7** D The system shall keep a saved question set until the instructor deletes it, so it can be used in more than one game.
- **2.8** E The system shall not allow a question set, or any question in it, to be edited or deleted while a game that uses the set has not finished.

3. Game setup

- **3.1** E The system shall allow an instructor to create a game from one of the instructor's question sets.
- **3.2** E The system shall give each game a game PIN that no other game that has not ended is using.
    - **3.2.1** E A game PIN shall be a randomly chosen 6-digit number.
    - **3.2.2** E The instructor's screen shall show the game PIN for the whole Lobby phase.
- **3.3** E The system shall allow the instructor to set the group size: the number of students per group, from ***2*** to ***6***.

- **3.4** E Each game shall be in exactly one of the following phases at a time, in this order:
    - **3.4.1** E **Lobby:** students can join. A new game starts in this phase.
    - **3.4.2** E **Grouping:** groups are assigned and students find their groups.
    - **3.4.3** E **Question Open:** a question is shown and groups can submit answers.
    - **3.4.4** E **Question Closed:** answers are no longer accepted and the results of the question are shown.
    - **3.4.5** E **Leaderboard:** the current standings are shown. The game then returns to Question Open for the next question.
    - **3.4.6** E **Finished:** every question has been played, or the instructor has ended the game (5.9).

4. Joining and groups

- **4.1** E The system shall allow a student to join a game in the Lobby phase by entering its game PIN and a username in a web browser on the student's own device.
    - **4.1.1** E The system shall check the game PIN before asking for a username. If the game PIN does not match a game in the Lobby phase, the system shall show an error message and keep the student on the join screen.
    - **4.1.2** E A username shall be from 2 to 24 characters long.
    - **4.1.3** E If the username is already in use in that game, the system shall show an error message and ask the student for a different name.
- **4.2** E The instructor's screen shall show the username of every student in the lobby and the total number of students.
    - **4.2.1** E The list shall update within ***1 second*** when a student joins or leaves.
- **4.3** D The system shall allow the instructor to remove a student from the lobby.
- **4.4** E When the instructor chooses to assign groups, the system shall move the game from Lobby to Grouping and put every student in the game into exactly one group.

    - **4.4.1** E Each group shall have the group size set in 3.3. When the number of students does not divide evenly, no two groups shall differ in size by more than one student.
    - **4.4.2** E Each group shall have a group color that no other group in the same game has, drawn from ***12*** colors.
    - **4.4.3** E If the students cannot fit into 12 groups at the chosen group size, the system shall show the instructor the smallest group size that fits, and shall not assign groups until the group size is changed.
    - **4.4.4** E Each student's device shall fill its screen with the student's group color and show the color's name as text.
- **4.5** E The instructor's screen shall list the members of each group.
- **4.6** D The system shall allow the instructor to move a student to a different group before the game starts.
- **4.7** O The system shall allow a student to mark that they have found their group, and the instructor's screen shall show how many students in each group have done so.
- **4.8** E The system shall allow the instructor to start the game only after groups have been assigned.

5. Gameplay

- **5.1** E The system shall present the questions one at a time, in the order of the question set.
- **5.2** E During Question Open, the instructor's screen and every student's device shall show the question prompt and the time remaining.
    - **5.2.1** E The time remaining shown on each student's device shall be within ***1 second*** of the time remaining on the instructor's screen.
- **5.3** E The system shall allow any member of a group to type and submit the group answer during Question Open. The answer field shall be disabled in every other phase.
    - **5.3.1** E The system shall accept only the first group answer submitted by each group for each question.

    - **5.3.2** E After a group submits, every member's device shall show the submitted group answer and shall not accept another answer for that question.
    - **5.3.3** E The system shall reject a group answer received in any phase other than Question Open.
- **5.4** E The system shall record the elapsed time of each group answer.
- **5.5** E The game shall move from Question Open to Question Closed when the time limit passes or when every group has submitted, whichever comes first.
- **5.6** E During Question Closed, the instructor's screen shall show the reference answer and each group's points for that question, and each student's device shall show the group's verdict and points for that question.
- **5.7** E During Leaderboard, the instructor's screen shall show the leaderboard and each student's device shall show the group's rank and total points.
- **5.8** E The game shall move to the next phase after Question Closed or Leaderboard only when the instructor chooses to continue. After the last question's Leaderboard, the game shall move to Finished.
- **5.9** D The system shall allow the instructor to end a game before the last question. The system shall then show the final results (8.1).

6. Answer grading

- **6.1** E The system shall send Jev each group answer together with the question prompt and the reference answer.
- **6.2** E The system shall get from Jev a confidence and an accuracy score for each group answer.
- **6.3** E The system shall give a group answer the verdict Correct when its confidence is 0.65 or higher, and Incorrect otherwise.
- **6.4** D If Jev returns no result within ***10 seconds*** of submission, the instructor's screen shall show the group answer and let the instructor mark it Correct or Incorrect.
- **6.5** D The system shall allow the instructor to change the verdict and accuracy score of any group answer before the game ends. The system shall then recalculate that group's points.

7. Scoring

- **7.1** E A group answer with an Incorrect verdict shall earn 0 points.
- **7.2** E A group answer with a Correct verdict shall earn *round(1000 × a × (0.5 + 0.5 × r))* points, where *a* is the accuracy score and *r* is the fraction of time remaining.
    - **7.2.1** E The fraction of time remaining shall be *max(0, (T − t) / T)*, where *T* is the time limit and *t* is the elapsed time.
    - **7.2.2** E For example, on a 60-second question: accuracy 1 at 0 seconds earns 1000 points, accuracy 1 at 60 seconds earns 500 points, and accuracy 0.8 at 30 seconds earns 600 points.
- **7.3** E A group that submits no answer for a question shall earn 0 points for that question.
- **7.4** E A group's total points shall equal the sum of its points for every question.

8. Results

- **8.1** E When the game ends, the instructor's screen and every student's device shall show the final leaderboard, with the top three groups marked.
- **8.2** E The system shall allow the instructor to view, for each question, every group's answer, verdict, accuracy score, and points.
- **8.3** D The system shall keep the results of each game until the instructor deletes them.

Non-functional requirements

9. Performance and capacity

- **9.1** E The system shall notify every connected device of a change in game phase within 300 ms of the change.
- **9.2** E For ***95%*** of group answers, the verdict shall be shown within ***5 seconds*** of the question closing.
- **9.3** E A single game shall support at least ***60*** students.
- **9.4** D The system shall support at least ***10*** games running at the same time.

10. Compatibility and reliability

- **10.1** E Students and instructors shall be able to use the system in the current versions of Chrome, Safari, Firefox, and Edge, on phones and laptops, without installing an app.
- **10.2** E Every screen shall be usable at a width of 360 pixels without scrolling sideways.
- **10.3** E If a student loses their connection, the student shall be able to rejoin the same game, with the same group, by entering the same game PIN and username. The device shall then show the current phase and, during Question Open, the time remaining.

11. Security and accessibility

- **11.1** E The system shall not send a question's reference answer to any student's device during Question Open.
- **11.2** E Only the instructor who owns a question set shall be able to view or change it.
- **11.3** E Once a game is Finished, the system shall not accept answers or any other actions from that game's students.
- **11.4** E The system shall always identify a group by its color name in text as well as by its color, so students with color vision deficiency can find their group.

Constraints

- **C1** E Answer grading shall be done by Jev (Typesafe AI).
- **C2** E The project shall be completed within the COMP 4110 Fall 2026 semester.