

Requirements

Requirements elicitation

The following two interviews were conducted to elicit requirements from users that currently use an app similar to Toohak. The first interview is with a high school teacher who uses a quiz app to create and run quizzes for her students, whereas the second interview is with a university student who has participated in various quizzes both at university and earlier in school.

Interview 1

Interviewee: Ruchi Jain

Occupation: High school teacher

Email: ruchijain75@gmail.com

Question 1: Have you used any quiz apps in your classes? If so then which ones did you use and why? Was there anything in particular that stood out about them?

Answer 1: I've only used Kahoot, but I've used it many times for my classes. It's a great app that gets my students engaged. I usually host a quiz every few weeks as revision after completing a part of the syllabus. One thing that I really like is that there are a plethora of quizzes available for public use on the Kahoot website. This makes creating a quiz much faster, since I can copy an original quiz and make any changes required. This is especially useful during busy weeks when I can't afford to make a revision quiz from scratch.

Question 2: Do you think there are any negative attributes associated with the app? Perhaps any features you don't like or things that hinder making or running quizzes?

Answer 2: I feel that it's quite difficult to measure the "success" of a quiz. I can never know if a quiz I made was genuinely useful to students, and can only guess if they enjoyed playing it. Of course there are statistics on who scored how many points but it's not a very accurate measure of how good my lessons have been. I don't know have insight on which parts of my quizzes I should be refining, which can get frustrating when you're trying to do better for your students. I only know how to improve on something when a student talks to me individually after class, which frankly speaking, is not that often.

Question 3: Since you brought up the topic of student feedback, I'm curious to know how you typically receive feedback from students after quizzes. Are there specific means you've tried using to gauge how the students found the quiz, like for example feedback forms?

Answer 3: I always ask the class if they enjoyed the quiz, and most students nod. I once tried setting up a Microsoft form for students to give feedback through, but nobody filled it out so I haven't done that since. Now, it's just if someone comes up to me personally after class then I'm happy to discuss what I can do to improve the quizzes. With a massive group of students, it is quite impractical to ask each person for feedback on the lesson or quiz.

Question 4: Do you think this situation can be improved in any way? Is there anything a quiz platform such as Kahoot can do to encourage students to give feedback?

Answer 4: That's a hard one, hmm. Maybe give the kids a bit of a bonus mark if they fill in the feedback at the end? I feel like my students will do anything for an extra few points!

Question 5: How well do you feel Kahoot's quiz tools cater to your needs as an educator? Are there any particular functionalities you wish were available for creating or running a quiz?

Answer 5: Overall, I am quite pleased with my experience. I think the app is incredibly engaging for the students. Even though it gets quite competitive, it's fun to see students putting their knowledge to the test. In terms of additional functionalities to add, I'd just emphasize the feedback point. Perhaps ask the students more targeted questions about the quiz such as "how did you find the difficulty level of the quiz?" or "what types of questions would you like to see more of?". This way they're not just writing vague statements, and instead their responses can be constructive.

Interview 2

Interviewee: Tanya Nayar

Occupation: Medicine student at UNSW

Email: tanya.nayar@gmail.com

Question 1: As a student, which quiz apps have you used in the past? What aspects stood out to you about them?

Answer 1: I've used multiple quiz apps in the past including Kahoot, Quizlet, and Mentimeter. Of course, Kahoot was always the go-to for all my teachers in high school and lecturers at university, so I'm more familiar playing that. What stands out every time is the sheer energy of the class when playing the game. The music, time pressure, and the concept of streaks all add to the thrill. It's just a wonderful atmosphere.

Question 2: Do you think there are any negative attributes associated with the app? Perhaps any features you don't like or things that hinder enjoying the game?

Answer 2: Kahoot is exciting to play, but the quiz format means that I only know if I am right or wrong on a question, and nothing more. If I get a question wrong, there is no way for me to know why my answer is wrong unless the teacher explains it, which they often don't due to lack of time. This makes it hard to learn since I don't even know why the correct answer is correct.

Question 3: How often do you find yourself providing feedback on the quizzes you play?

Answer 3: I rarely do. Sometimes my professors display a QR code at the end of the quiz or lesson that links to a form for feedback, but to be honest I usually can't be bothered to fill it out.

Question 4: Is there anything that would motivate you to provide feedback?

Answer 4: Probably just make it less of a pain. I don't mind giving feedback, but as I said it's too inconvenient to go to an external form and type in a response. So perhaps if the feedback was something quick like a rating out of 10, then I wouldn't mind. Otherwise if I have a bigger concern, I find it easier to just talk to the professor after class rather than filling in a feedback form.

Question 5: How well do you feel Kahoot's quiz tools cater to your learning needs? Are there any particular functionalities you wish were available while playing the game?

Answer 5: I think Kahoot is a fun app, and I love the concept of learning through a game. However, sometimes I feel that the "game" aspect of it overtakes the "learning" aspect. As we just discussed, there's no mechanism to know why the correct answer is the correct answer, or why a particular answer is wrong. So with regards to your question about what's missing, I would love if there was a short explanation after every question about why each option is right or wrong so I can understand, not just memorize.

Proposed Solutions

Based on the requirements elicited from both a teacher's and student's perspective, the following solutions are proposed to improve the functionality of Toohak.

The teacher emphasized that a great feature of Kahoot is the access to publicly available quizzes. Currently in Toohak, quizzes are only accessible by the owner, and so a potential solution would be to allow certain quizzes to be made public, so it can be duplicated. There would also need to be a way for a user to duplicate a particular quiz.

The student spoke about how a simple quiz right/wrong answer is not very conducive towards learning. This problem can be addressed by allowing the quiz creator to add an optional explanation of answers to each question. The explanation will then be displayed along with the answers.

Both interviewees also suggested that the feedback system for quizzes is quite poor. Students rarely give out feedback due to inconvenience, and consequently teachers struggle to improve the quality of their quizzes. A solution is to prompt the students to rate the quiz after all questions are finished, but before the final results are out. There can also be a few optional short-answer questions that are created by the teacher. Filling out this feedback can contribute towards bonus points in order to encourage students to be more responsive.

User stories and Use Cases

User Story 1: As a teacher, I want the option for quizzes to be made public and duplicable, so when I want to make a quiz, I can duplicate and edit an existing quiz as opposed to creating a new one from scratch.

Acceptance Criteria:

- Quiz owner should be able to share any of their quizzes publicly.
- Publicly shared quizzes should be accessible to other educators through a designated page or section on Toohak.
- Publicly shared quizzes should be categorized appropriately (e.g. by topic, by owner) to facilitate easier searching and filtering by other educators.
- The author's name should be displayed alongside the publicly shared quiz to give appropriate credit to the original creator.
- A 'duplicate quiz' button should be provided alongside each publicly shared quiz to allow for convenient duplication by other creators.
- There should be an option to make a public quiz private if the owner no longer wants to share it with others.

User Story 2: As a student, I want to be able to see an explanation of answers to the questions after answering them so I can see where I went wrong.

Acceptance Criteria:

- The quiz creation interface should include an option for the quiz creator to provide explanations for each answer to a question. This option should be accessible while creating or editing the quiz.
- When adding an explanation, the quiz creator should be able to input text, images, or multimedia content to enhance the clarity and effectiveness of the explanation.
- Explanations should be displayed after the answers to a question are revealed and should be removed before moving on to the next question.

- When exporting or sharing the quiz with other educators, the explanations should be included in the quiz file or link, ensuring that the question feedback is available to learners using the shared version.

User Story 3: As a teacher, I want more students to give feedback so I can understand how to better refine my quizzes in the future.

Acceptance Criteria:

- After the last question of the quiz has been answered, a prompt should appear asking the students to rate the quiz on a numerical scale.
- The page should also optionally display a short-answer question that should be customizable by the quiz creator beforehand.
- The quiz creator should have access to view the aggregated ratings and feedback provided by students after the quiz has ended.

Use case for student feedback and answer explanation:

1. User (teacher) registers and logs into Toohak.
2. Toohak displays interface to create a quiz to the user (teacher).
3. User (teacher) creates a quiz with questions, answers and optional answer explanations.
4. Toohak successfully stores the quiz, and allows the user (teacher) to start a session for the quiz.
5. User (teacher) starts a quiz session.
6. Toohak generates a session ID for the creator (teacher) to share with other users (students).
7. Users (students) join the quiz session using the session Id.
8. User (teacher) starts the quiz.
9. Toohak displays first question and answer options, allowing players to select an answer.
10. Users (students) can select an answer until the timer runs out.

11. Toohak displays the results of the question and the correct answer(s). Answer explanations are optionally displayed alongside the answer results, depending upon if the teacher had decided to include answer explanations.
12. Steps 9 - 11 are repeated for all other questions until the quiz ends
13. After the final question, a feedback page is displayed, and students are prompted to answer.
14. Students rate the quiz and give feedback if prompted. Bonus marks may optionally be awarded to students who answer the feedback questions.
15. Feedback is stored, and then the final results page is displayed with everyone's final score.
16. User (teacher) is able to view the quiz feedback after the quiz session is over.

Requirement Validation for Use Case

Teacher: This looks great. The feedback part is exactly what I'm looking for. It's great that you have the option to include different types of feedback: both quantitative and qualitative. Moreover, I love that you took my idea of awarding bonus points to students that fill out the feedback completely - hopefully that will get them excited!

Student: This pretty much sums up our conversation. I'm glad to see the answer explanations, and especially the fact that they're optional for each question. Some questions are quite obvious to understand and it would be a waste of time for students and the teacher to worry about the answer explanation. However, this way the teacher can provide an explanation only for more difficult questions.

Design

Interface design and API endpoints

Functionality 1 - Duplicate quiz

HTTP Method: POST

HTTP Route: /v1/admin/quiz/{quizid}/duplicate

Description:

- A particular quiz's contents get duplicated into a new quiz.
- The newly created quiz should be private to the user that duplicates the quiz.
- The new quiz's time created and time last edited should be updated.
- The new quiz's author should be the current user.

Parameters:

<u>Parameter</u>	<u>Input source</u>	<u>Data type</u>
token	header	string
quizid	path	number

Responses:

<u>Status code</u>	<u>Description</u>	<u>Example return</u>
200	OK	{ "newQuizId": 12 }
400	If any of the following are true:	{ "error": "error" }

	<ul style="list-style-type: none"> - Quiz ID does not refer to a valid quiz - Quiz ID does not refer to a quiz that the user owns, or a quiz that is publicly available. 	
401	Token is not a valid structure	{ "error": "error" }
403	Provided token is valid structure, but is not for a currently logged in session	{ "error": "error" }

Functionality 2 - Make quiz public

HTTP Method: PUT

HTTP Route: /v1/admin/quiz/{quizid}/public

Description:

- Make a particular quiz publicly available to all users.
- The time last edited should be updated.

Parameters:

<u>Parameter</u>	<u>Input source</u>	<u>Data type</u>
token	header	string
quizid	path	number

Responses:

<u>Status code</u>	<u>Description</u>	<u>Example return</u>
200	OK	{ }
400	If any of the following are true: <ul style="list-style-type: none">- Quiz ID does not refer to a valid quiz- Quiz ID does not refer to a quiz that the user owns.- Quiz is already public	{ "error": "error" }
401	Token is not a valid structure	{ "error": "error" }
403	Provided token is valid structure, but is not for a currently logged in session	{ "error": "error" }

Functionality 3 - Rate quiz**HTTP Method:** PUT**HTTP Route:** /v1/player{playerid}/rate**Description:**

- Prompt players to give a numerical rating between 1 and 10 to the quiz.
- Players can resubmit ratings until the teacher moves onto final results.

- If a player does not submit any rating, then the player's default rating submission should be 0.

Parameters:

<u>Parameter</u>	<u>Input source</u>	<u>Data type</u>
playerid	path	number
rating	body	number

Responses:

<u>Status code</u>	<u>Description</u>	<u>Example return</u>
200	OK	{ }
400	<p>If any of the following are true:</p> <ul style="list-style-type: none">- Player ID does not exist.- Session is not in RATING_AND_FEEDBACK state.- Rating is not between 1 and 10	{ "error": "error" }

Functionality 4 - Create feedback question

HTTP Method: POST

HTTP Route: /v1/admin/quiz/{quizid}/feedbackquestion

Description:

- Create a new feedback question for a particular quiz.
- The quiz's time last edited should be updated.

Parameters:

<u>Parameter</u>	<u>Input source</u>	<u>Data type</u>
token	header	string
quizid	path	number
question	body	string
bonusmark	body	number

Responses:

<u>Status code</u>	<u>Description</u>	<u>Example return</u>
200	OK	{ "feedbackQuestionId": 12 }
400	If any of the following are true: <ul style="list-style-type: none">- Quiz ID does not refer to a valid quiz- Quiz ID does not refer to a quiz that	{ "error": "error" }

	<p>the user owns. Question string is less than 5 characters in length or greater than 50 characters in length</p> <ul style="list-style-type: none"> - Bonus marks are less than 0. 	
401	Token is not a valid structure	<pre>{ "error": "error" }</pre>
403	Provided token is valid structure, but is not for a currently logged in session	<pre>{ "error": "error" }</pre>

Functionality 5 - Give quiz feedback

HTTP Method: POST

HTTP Route: /v1/player/{playerid}/feedback/{feedbackquestionid}

Description:

- Allow the players to give written feedback on the feedback questions created by the quiz creator.
- If a player submits feedback, then they can be awarded bonus points for answering the feedback question. This functionality must be decided by the quiz creator when creating the feedback questions.

Parameters:

<u>Parameter</u>	<u>Input source</u>	<u>Data type</u>
playerid	path	number
feedbackquestionid	path	number
feedback	body	string

Responses:

<u>Status code</u>	<u>Description</u>	<u>Example return</u>
200	OK	{ }
400	<p>If any of the following are true:</p> <ul style="list-style-type: none">- Player ID does not exist.- Feedback question ID does not exist.- Session is not in RATING_AND_FEEDBACK state.- Feedback is shorter than 5 characters or longer than 100 characters.	<pre>{ "error": "error" }</pre>

Functionality 6 - Quiz question create (modified from iteration 3)

HTTP Method: POST

HTTP Route: /v3/admin/quiz/{quizid}/question

Description:

- Create a stub question in a quiz.
- Time last edited should be updated
- Answer explanations can be empty.

Parameters:

<u>Parameter</u>	<u>Input source</u>	<u>Data type</u>
token	header	string
quizid	path	number
questionBody	body	object*

* the object is in the following example form:

```
{
  "questionBody": {
    "question": "Who is the Monarch of England?",
    "duration": 4,
    "points": 5,
    "answers": [
      {
        "answer": "Prince Charles",
        "correct": true,
        "explanation": ""
      },
      {
        "answer": "Joe Biden",
```



```

    "correct": false,
    "explanation": "He is not even British."
  }
],
"thumbnailUrl": "http://google.com/some/image/path.jpg"
}
}

```

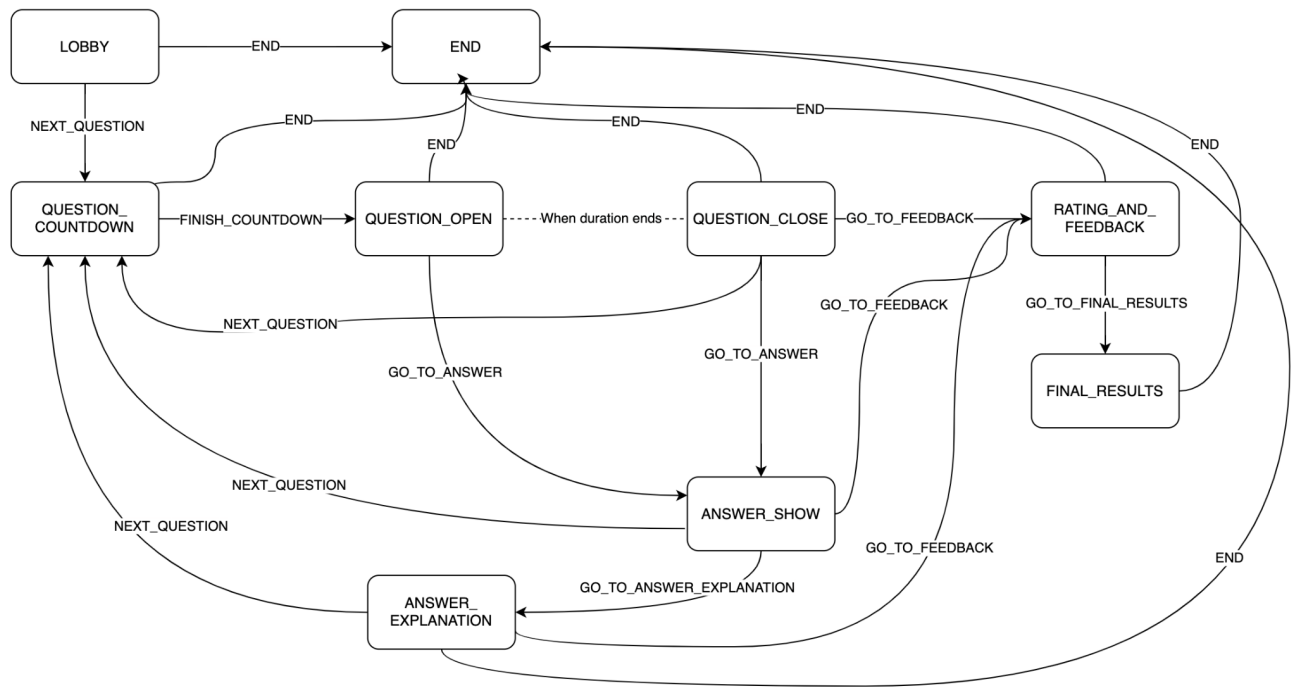
Responses:

<u>Status code</u>	<u>Description</u>	<u>Example return</u>
200	OK	{ "questionId": 12 }
400	<p>If any of the following are true:</p> <ul style="list-style-type: none"> - Quiz ID does not refer to a valid quiz - Quiz ID does not refer to a quiz that this user owns - Question string is less than 5 characters in length or greater than 50 characters in length - The question has more than 6 answers or less than 2 answers - The question duration is not a positive number - The sum of the question durations in the quiz exceeds 3 minutes - The points awarded for the 	{ "error": "error" }

	<p>question are less than 1 or greater than 10</p> <ul style="list-style-type: none"> - The length of any answer is shorter than 1 character long, or longer than 30 characters long - Any answer strings are duplicates of one another (within the same question) - There are no correct answers - The thumbnailUrl is an empty string - The thumbnailUrl does not return to a valid file - The thumbnailUrl, when fetched, is not a JPG or PNG file type - Answer explanation string are not all less than or equal to 100 characters in length. 	
401	Token is not a valid structure	<pre>{ "error": "error" }</pre>
403	Provided token is valid structure, but is not for a currently logged in session	<pre>{ "error": "error" }</pre>

State Diagram

The following state diagram represents the workflow of playing a quiz with the proposed added features, i.e. including a quiz feedback page, and an optional answer explanation after each question.



In case the above image is too small to view, you may visit the following link:

<https://drive.google.com/file/d/10-vREk8c58PKkEvePytT-WjbgjFaiZbv/view?usp=sharing>