Sunbird

Project: Sunbird QuML Player
Mentor Name: Kartheek Palla
Mentee Name: Deepdarshan

Contact information :

Name: Deepdarshan

Email ID: deepdarshan@gmail.com

Github Username: https://github.com/deepdarshan21

Mobile: (+91) 7654969454

Country: India

Timezone: **Indian Standard Time** (UTC +05:30)

Primary Language: English, Hindi

Linkedin: Deepdarshan

University Info:

University Name: **Shri Mata Vaishno Devi University, Jammu & Kashmir**

Current year and Degree: 3nd Year, Bachelor of Technology in Computer Science and Engineering

Expected Graduation Date: July 2023

Synopsis:

Sunbird QuML Player is an open-source javascript player, that enables setting up question banks that contain questions and question sets for various use cases such as practice, assessment, quiz, worksheets and many more.

Currently, the QuML player supports the creation of a Single correct MCQ by using a question set editor, by bulk upload of questions or by API. It supports the configuration of questions set by randomizing the questions, limiting the number of attempts, and setting a timer.

There are two main problems with the current state of QuML players. First, it only supports a Single correct MCQ which gives a high chance for learners to guess the correct answer to the question. Second, the creators are limited to configuring questions by just randomizing the questions, which allows learners to just identify the question and cheat the answer easily.

This project aims to solve these problems. First, enabling the support for Multiple correct(more than one) MCQ will significantly decrease the chance of learners guessing the correct answers to questions. And second, by giving the option for randomizing the options(shuffling of question's options) to the creator while setting the assignment or quiz. By solving both of these problems Sunbird will become a good open-source choice for universities and other organizations for conducting their online quizzes and assignments.

My qualification to carry out this project arises from my sound knowledge of frontend framework React, NodeJs and database MongoDB. I have robust experience in working with UI creation and feature implementation.

Apart from that, I am confident in my ability to pick up new skills and technology quickly should the opportunity to do so arise during my project.

Relevant Skills and Motivation

What are your language of choice and how they do relate with project?

As mentioned above I have sound knowledge and experience of JavaScript and NodeJs. Since this project is primarily made on Angular, which is nothing but a Javascript Framework so I can easily relate to this project and contribute to its betterment. Other than that, I also have a couple of projects in Typescript so that will be an added benefit for me.

What is your motivation to apply for this project?

We all have seen and gone through the classwork in this covid era which was mostly online and prone to cheating. It made use of nothing but Google Forms which according to me is not so efficient in conducting tests and exams. So, I want to work on this project which is aimed at providing better online assignments. As the world is changing and moving towards digitalization, this project is going to have a direct impact on millions of learners across the world.

Project Details

I am interested in Sunbird's QuML player project. My goal would be to improve the player by enabling the option for shuffling options in question and giving the support for Multiple correct MCQ(MMCQ) to creators. I will also work on converting a question from MCQ type to MMCQ type and vice versa.

Project Overview:

Working:

Sunbird inQuiry's QuML player is an open-source MIT licence platform that enables the setting up of question banks that can contain questions and question sets for various use cases such as practice, assessment, quiz, worksheets and many more. It is primarily made for assessing learners' understanding of a concept is vital to determine whether or not the learner has mastered the concept.

Prashnavali is an open-source solution built on Sunbird building blocks which are adopted by DIKSHA - the national learning platform that is used by all state education departments. The platform enables crowd-sourcing of questions by teachers that can be tagged to specific learning outcomes, and be distributed to users as worksheets and assessments across offline/online channels.

Key capabilities:

- Creation of question(s) and question set(s) as per an interoperable QuML spec either using the question set editor, by bulk upload of questions or API.
- Configuration of the question set behaviour. For ex., randomize the questions from the question bank, limit the number of attempts, set a timer etc.
- Tagging of question(s) and question set(s) with meaningful metadata useful for discovery and analysis.
- Curation and publishing of question(s) and question set(s). Publish workflow also ensures that the published assets can be played in both offline & online modes.
- The player for question set(s) is embeddable, configurable and extendable.

Problems:

There are mainly two problems in the present state of Sunbird inQuiry:

- Shuffle answers to increase the efficacy of learning: Randomization of questions in a question set and shuffling of answers are some of the ways to ensure that learners are prevented from gaming the assessment or quiz. the inQuiry has the capability to randomize questions within a question set but does not yet enable creators to shuffle answers within each question.
    - Question schema needs to be updated with a new property which enables ‘Shuffling of answers’ for Questions.
    - Question set editor, the tool used to create question sets, should allow creators to enable/disable ‘Shuffling of answers’.

    - End users when consuming these question sets using the QuML player should experience this behaviour.
- Enable MMCQ (More than one correct answer for Multiple Choice Question): Current MCQ implementation allows for creators to create MCQs with only one right answer. Having more than one right answer to an MCQ question brings down the chance of learners guessing answers and getting questions right - which can help in painting a true picture of learners' understanding of a concept.
    - Question creation UI we should enable creators to mark more than one option as a correct answer using the checkbox
    - End-users while consuming, he/she can select multiple options in all layouts.
    - The score should be calculated based on the below logic
        - If the user chooses only all correct options then the only score should be 1 and the same will be sent in telemetry events.
        - If the user chooses only one correct option score should be 0 only and the same will be sent in telemetry events.
    - Send multiple options in telemetry Data.

Solution:

Solutions to both the problems are proposed and explained below in the implementation details as Milestone 1 and Milestone 2.

Implementation Details

Milestone 1: Shuffle Options in Question

Currently, the QuML player supports the option of shuffling the questions but lags in the option for shuffling of options(answer) of questions.

I plan to use my own *shuffleArray* function to shuffle the option of the question in random order. It will be used to manipulate the options of question in random order to each user before passing *options* to the *mcq* component.

```
// Randomize array in-place using Durstenfeld shuffle algorithm
shuffleArray(array) {
  for (let i = array.length - 1; i > 0; i--) {
    const j = Math.floor(Math.random() * (i + 1));
    [array[i], array[j]] = [array[j], array[i]];
  }
  return array;
};
```

I will be creating the *shuffleArray* function, this function will randomize(shuffle) the elements of the input array using the Durstenfeld Shuffle Algorithm.

There are many other options to shuffle the array, by using the npm library like *Lodash* which has a *_.shuffle()* function (https://lodash.com/docs/4.17.15#shuffle) to shuffle the array. But using our own function gives benefits not depending on others for small things. And using our own function over the npm package makes the whole application lighter.

I will be using the *shuffleArray* function before passing my options to components to shuffle the options.

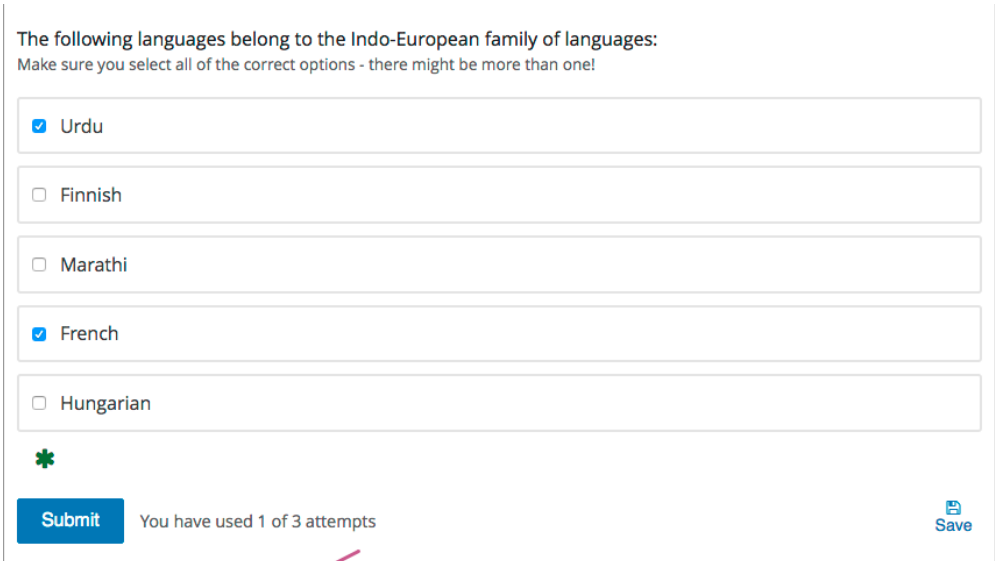
```
// mcq.component.ts
initOptions() {
  for (let j = 0; j < this.options.length; j++) {
      let imageUrl;
      if (this.options[j].url) {
          imageUrl = this.options[j].url;
      }
      const option = this.options[j];
      const optionValue = option.value.body;
      const optionHtml = this.domSanitizer.sanitize(
          SecurityContext.HTML,
          this.domSanitizer.bypassSecurityTrustHtml(optionValue)
      );
      const selected = false;
      const optionToBePushed: any = {};
      optionToBePushed.index = j;
      optionToBePushed.optionHtml = optionHtml;
      optionToBePushed.selected = selected;
      optionToBePushed.url = imageUrl;
      this.mcqOptions.push(optionToBePushed);
  }
  // Shuffle the options of question before passing it!
  Map((mcqOptions: mcqOptions[]) => this.shuffleArray(mcqOptions));
};
```

Here I will also be working around building a toggle button to enable/disable shuffling.

After completion of this milestone, end-users when consuming these question sets using the QuML player should experience this behaviour(shuffled options). This will ensure that learners are prevented from gaming the assessment or quiz.

Milestone 2: Giving the support for MMCQ

Currently, the QuML player is limited to only one type of question, MCQ. Giving the support for MMCQ(more than one correct option MCQ) will bring down the chance of learners' guessing answers and getting questions right - which can help in painting a true picture of learners' understanding of a concept. Creators will get the option of creating MMCQ-type questions.



I will be using *type="checkbox"* *in* the *mmcq-options brand new component similar to type="radio"* in the *mcq-options* component.

```
<input type="checkbox" name="checkbox" [checked]="mcqOption.selected" id="option-checkbox" tabindex="-1">
```

Timeline:

Community Bounding Period (June 18 - June 19):

I will use this time duration to be familiar with all the fellow C4GT participants as well as all the mentors.

Week 1 & 2 (June 20 - July 3):

I will utilize this time duration for planning out my goals as well as discussing the workflow of this project with my mentors. I will also adjust myself to the project workflow and start to work according to the scrumban methodology.

I will have my semester exams from June 23rd to June 30th, so I will be able to dedicate 2-4 hours a day. After my exams are over, I will dedicate more than 8 to 10 hours per day.

Output of this period:

- Locally set up the repo with system configuration
- Well understanding of the repo

Week 3 (July 3- July 10):

For this week, my goal would be to enable the option for shuffling of options of the questions. I will be configuring/updating the question's schema to toggle the shuffle option as the creator enables it in the question set editor.

Output of this period:

- Option for shuffling answer can be enable/disable by creators

Week 4 (July 11- July 17):

For this week, my goal would be to create a component from scratch which will support Multiple correct(more than one correct) MCQ. I will also be working around building the logic for calculating the score of MMCQ.

Output of this period:

- Creators create MMCQ-type questions and learners can experience the same

Week 5 (July 18- July 24):

In this period, I will be working around converting questions from MCQ to MMCQ type and vice versa.

Output of this period:

- MCQ question will behave like MMCQ type question to learners while it will have only one option correct.
- MMCQ-type questions will behave like MCQ-type questions to learners and marks will be given to learners if he/she selects one of the correct options.

Week 6 (July 25 - July 31):

This week will be the final week of the coding period. The aim of this period is to solve the active issues from Github and make the final report of my coding period.

Output of this period:

- Solve the active issues
- Submit the code and report for evaluation.

Future Development:

I have some ideas (like an option for setting a timer on each question, disabling copy of questions to creators) for Sunbird's QuML player that I will try to complete in my coding period(if time allows).

I will be proud to complete Code for GovTech(C4GT) under Project Sunbird. As I will be well connected with the organization, I will try to help out other contributors and juniors.

Availability:

When do your classes and exam will finish?

My classes are almost over by 15th June but exams are scheduled from 23rd June to 30th June and mini-project submission on 1st July. And from 2nd July to 15th August I have summer break from college.

Do you have a full or part-time internship planned for this summer?

I don't have any prior commitment for a full or part-time internship this summer. If I'm selected for Code for GovTech, it will be my only job for this summer.

How many hours per week do you available for a summer project?

In the first 10 days when the coding period begins, I will only be able to give 20 to 25 hours per week(2 to 4 hours/day) as my major exams will be going on at that time. After my exams are over, I will easily give 40 to 50 hours per week (8 to 10 hours/day) to make up the work for the first 10 days and complete the work before time.

Personal Background:

About me:

I am a passionate programmer. My passion for programming originated while using mobile phones(especially smartphones), in my childhood, I was really curious to know how WhatsApp can send messages to my friend within seconds, and how I was able to jump into the Subway Server game by just swiping up on my screen.

I am a web, Linux and open source enthusiast and I have taken part in various open-source events like Kharagpur Winter of Code, GirlScript Summer of Code, FOSS Overflow and Open Code. I have made various personal web-based

full-stack projects which are showcased on my Github profile. I gained knowledge in the web development area using various courses and workshops available via the Github student developer pack and technical blogs written by highly skilled industry experts.

Apart from web development, I head The Code Club at my university, guiding students in their open-source and development journey. And also I am the Outreach media head of my university's Competitive Coding Club(formed by CodeChef).

I have even participated and won in team events like university hackathons. I have also done various certifications like Postman Student Expert and 30 days of Google Cloud.

I also do Competitive Programming on Codechef and Leetcode, as I have solved more than 300+ questions on Leetcode and have a max rating of 1761(3⭐) on CodeChef.

Education:

I'm currently doing my Bachelor's Degree in Computer Science and Engineering(BTech CSE) from Shri Mata Vaishno Devi University(SMVDU). Currently, I am a third-year student and will complete my degree on July 23'.

I have done my primary education at Kendriya Vidyalaya(KV) No. 2, Air Force Station Jodhpur.

Relevant work experience with the proposed tech stack:

I have good experience in UI creation and feature implementation in React. As part of Learn and Empower(formally Resonate Learning) as a Web Developer Intern, I redesigned the complete UI for their product's(resonate game) dashboard and implemented various features like inviting friends. I have also been part of APIcon as Software Developer Intern, and there I made a notification system using

React and IconicJS. Also, I have been working on Javascript for more than a year, mostly on DOM manipulation.

Any prior work experience with open source development:

I have good work experience with open source development. I have been part of various open-source events like Kharagpur Winter of Code, GirlScript Summer of Code, FOSS Overflow and Open Code. I mostly use Git and GitHub for the development of my project as git allows me to easily collaborate with others.

Why Me?

I am an enthusiastic Open Source developer who loves to contribute to open source for the betterment of the world. And I have a good working knowledge of frontend framework React(and currently learning Angular), Javascript and CSS, which makes me suitable for this project. I also have experience in frontend development and open source contribution which makes me unique and the best fit for this project.