

Capstone Project Proposal



Mariyyah Essam Samarin

Business Goals

Project Overview and Goal What is the industry problem you are trying to solve? Why use ML/AI in solving this task? Be as specific as you can when describing how ML/AI can provide value. For example, if you're labeling images, how will this help the business?	<p>In recent decades, knowledge became easier to access due to the internet and technology, but the difficulty lies in how to take advantage of these resources to learn. Our project aims to enhance an education app, that helps students to learn the English language by customizing a special curriculum for each student based on their levels. This feature will be capable to improve student level and increase the number of app users. The machine learning/ Artificial intelligence field can provide significant value to our project, starting with labeling questions and materials level, providing curriculum suggestions, and analyzing student performance.</p>
Business Case Why is this an important problem to solve? Make a case for building this product in terms of its impact on recurring revenue, market share, customer happiness and/or other drivers of business success.	<p>Learning the English language is an essential skill, especially now all online courses and articles are mainly in English. However, traditional learning styles are not effective as it not tolerated individual abilities. We can use ML algorithms to provide a more efficient and engaging learning style. By offering a personalized learning experience, we expect more satisfactory student so, we attract more student to join which enhance recurring revenue, leading to greater market shear.</p>
Application of ML/AI What precise task will you use ML/AI to accomplish? What business outcome or objective will you achieve?	<p>We aim to use ML/AI to build a customized language-learning curriculum. This includes analyzing student level, identifying areas of strengths and weakness, then generating appropriate materials and exercises that help the student to improve his language. However, there are some business outcomes:</p> <ol style="list-style-type: none">1- Increase customer satisfaction

- 2- Increase customer engagement and motivation
- 3- Improve language proficiency
- 4- Increase revenue

Success Metrics

Success Metrics

What business metrics will you apply to determine the success of your product? Good metrics are clearly defined and easily measurable. Specify how you will establish a baseline value to provide a point of comparison.

One of the most important and measurable matrices is a learning outcome matrix, our main goal is to enhance and speed up the education level of the student. There are lots of other matrices we can use, such as:

- 1- Revenue growth
- 2- Market shear

By tracking these matrices, we can know the impact of the feature and if it succussed or not.

Data

Data Acquisition

Where will you source your data from?

What is the cost to acquire these data?

Are there any personally identifying information (PII) or data sensitivity issues you will need to overcome?

Will data become available on an ongoing basis, or will you acquire a large batch of data that will need to be refreshed?

We obtain our data directly from our app, as we have users of the application whose taking lessons and exams for two years, so buying data is not preferred in our case it will cost more and if we need more data to avoid bias, we will buy it with a planned budget.

Furthermore, the dataset will contain the following class:

- user information: age, language level, the duration taken in each level.
- level details: reading, listing, and writing tasks.
- Question bank that is associated with each level.

note that our database is a collection of string features and we have labeled audio in the listening part, so we are not dealing with videos or images. One potential downside of the schema of our dataset is when we build an adaptive learning system using AI\ML we use an algorithm that adjusts itself automatically, so we need to discuss the quality of our data with a data scientist before building a machine learning model. However, our data schema provides many benefits like scalability and consistency, one drawback of our data schema is the rise of one of the maintaining issues which is the maintenance time and cost of the data set, as more users use our application database will grow so the time

	<p>and cost will be extremely high. Furthermore, there are tracking tools and analytics software such as Google Analytics and other applications that need subscriptions. Even if we extract data within the application, there is a privacy problem arises, as we use users' data to build a machine-learning model. So, we will follow best practices to protect PII also, we will comply with all rules and regularization related to data privacy and security. However, biases are considered in our case, the data will be collected from the app so, we need to update periodically as the data will bias to the student level at a specific period.</p>
<p>Data Source</p> <p>Consider the size and source of your data; what biases are built into the data and how might the data be improved?</p>	<p>There are three types of bias we need to consider, so I will mention the bias type and then the solution to avoid it:</p> <ol style="list-style-type: none"> 1- Model bias is when the dataset bias toward a specific level for example, so the model will always predict a learning style that is suitable for that level. We can avoid this problem by collecting more data from all levels and making a balanced dataset. 2- Data bias occur when we collect data according to certain learning style. We can avoid that by containing all useful data that relates to each style in our dataset. 3- Annotation bias is a human bias that occurs in the annotation process. We will provide strict instructions for annotators to prevent this type of bias. <p>The size of our training set is 50,000 which is relatively small. Moreover, some types of bias can be enhanced by increasing the size of our dataset.</p>
<p>Choice of Data Labels</p> <p>What labels did you decide to add to your data? And why did you decide on these labels versus any other option?</p>	<ol style="list-style-type: none"> 1- Level of material 2- Level of questions 3- Level of language proficiency: A1,B1 and C1.... 4- Duration of course: one month or more 5- Assessment score: use it as a base for the learning plan <p>We choose these data depending on the objective and goal of the model.</p>

Model

Model Building How will you resource building the model that you need? Will you outsource model training and/or hosting to an external platform, or will you build the model using an in-house team, and why?	<p>We will use open-source machine learning models found in Hogging Face or GitHub and look up the license of use before we use it. However, we also may use AWS service to train our model because we have a huge data set and we do not have a machine learning team in our technical department so, the cost of using an external platform will be lower than building a new team.</p>
Evaluating Results Which model performance metrics are appropriate to measure the success of your model? What level of performance is required?	<p>An ideal adaptive learning system combines more than one machine learning algorithm into the model, thus using cross-validation to evaluate the model will be better than internal/external validation. Be aware that cross-validation is a high-priced evaluation method, especially with the huge dataset. In addition to cross-validation, we will measure model performance using the F1 score combined between two evaluation matrices which are precision and recall with the help of Beta to adjust the F1 score toward the important case. Also, the F1 score of the model should be above 0.8 to accept the model or to pass the user to a higher level. In addition. So, how we will use the F1 score in our model? we use the F1 score to evaluate user progress in assessment and exercise to pinpoint strengths and weaknesses of the user in language usage, in other words, the model will adapt to user performance and provide a personalized curriculum based on the F1 score. Furthermore, will use the receiver operating characteristic (ROC) to determine the optimal threshold for the model, the ROC describes how far the model can distinguish between classes. In our case, ROC helps define the user level, and if she/he will pass the current level or not. Also, if we need to compare between two models using ROC we will use the area under the curve thus, the model with a higher AUC is more precise and accurate,</p>

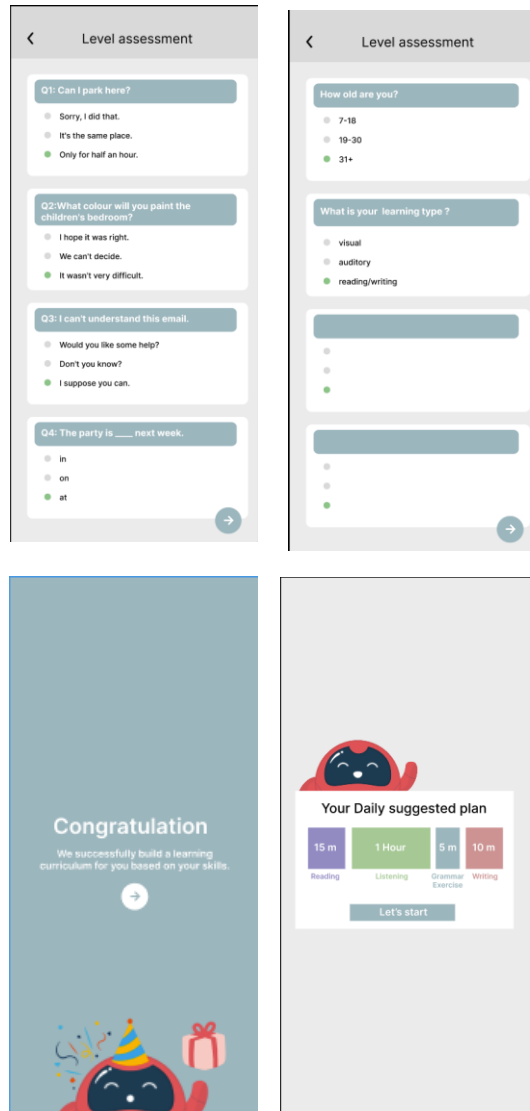
Minimum Viable Product (MVP)

Design

What does your minimum viable product look like? Include sketches of your product.

MVP of our app:

- Level assessment
- Learning curriculum
- Exercises
- Progress tracking



Use Cases

What persona are you designing for? Can you describe the major epic-level use cases your product addresses? How will users access this product?

The target of our app is people who need to learn English in an attractive way, so our app will offer a new experience for them.

Major epic-level cases:

- 1- Level assessment: to know the student's level
- 2- Suggested curriculum
- 3- Learn and exercise

The journey of students starts with an assessment to access their first lesson then interacting with each level and providing suitable content for them.

Furthermore, here are some of the prototypical users we will have in our app:

- 1- Jameel, a Saudi high school student, wishes to enhance his English language abilities in order to pass the IELTS exam and seek to study abroad. Jameel spends one hour per day using my application to improve his reading, writing, listening, and speaking skills. He prepares for the exam by using the application's IELTS-specific materials and practice tests. He also makes use of the app's individualized feedback and progress-tracking capabilities to measure his progress and discover areas for development.
- 2- Amnah, a local guide in the Middle East, wishes to improve her English abilities in order to better engage with tourists and convey the history of her nation to them. Amnah has a strong grammar foundation, but she struggles to speak and think in English fluently. As a result, she utilizes my application twice a week to listen to and study the recommended curriculum. She also uses the application's conversation practice and speaking exercises to increase her English fluency and confidence.

Roll-out

How will this be adopted? What does the go-to-market plan look like?

We already have a published application; we just need to download the new version of the app into the App Store and Play Store.

- Pre-lunch plan
 - 1- Target marketing: our app serves anyone who wants to enhance their English language, including all levels of proficiency the app can be customized to meet the need of the learner.
 - 2- Pricing strategy: we use a subscription model; users can choose the type of subscription based on accessed features and content.
 - 3- Value Proposition and Product Messaging: The value proposition for the application is to provide a customized and adaptive learning method that is tailored to each user's goal and level. Meanwhile, The benefits of utilizing the program, such as improving fluency, and growing vocabulary, should be highlighted in the product messaging.
 - 4- Distribution Plan: App Store, Google Play
- Post-lunch plan
All post-lunch plans must describe in the pre-launch plan because it requires monitoring and change on an ongoing basis to ensure that the product is effectively reaching and engaging the target audience.

Post-MVP-Deployment

Designing for Longevity

How might you improve your product in the long-term?
How might real-world data be different from the training data?
How will your product learn from new data?
How might you employ A/B testing to improve your product?

The product will have an updated dataset every 3 months or more depending on the amount of data we got from the users of the app, so we will train and update the model periodically. We will provide a button for feedback on each page of our app, so if students notice any error or face unclear content, they will send feedback to the development team. However, we will encourage the student who gives us feedback a free week as a reward. We also need to update our data set and train the model periodically.
Real-world data will not be different from our data, as we got the data from the app.
Our product suggests a curriculum for the user depending on their level, so our dataset contains

	<p>academic contents for different levels and student performance to detect the pattern of learning for the students.</p> <p>If we update the dataset and train the new model we won't publish the new version directly, we will use the A/B test to decide whether the update serves the new goal or not.</p>
<p>Monitor Bias</p> <p>How do you plan to monitor or mitigate unwanted bias in your model?</p>	<p>Here is some method for monitoring unwanted bias in our model:</p> <ol style="list-style-type: none"> 1- Regular monitoring: analyze feedback and performance metrics to discover any potential biases or flaws in the model. 2- Data source: ensure the data cover all regions and types of users to avoid biased toward a specific group. 3- Adversarial testing: is a method for detecting and mitigating undesirable or weakness of model.