SINGAPORE HOKKIEN HUAY KUAN
National Thinkers Challenge 2024
Future Schools

PHASE 1 – IDEATION PROPOSAL SUBMISSION

Instructions

1. This document will guide you through the ideation proposal submission.

2. Do not leave any sections empty.
   Optional: You may include supporting documents, photographs, diagrams, charts, or tables where appropriate

Definition of an Ideation Proposal

Your written proposal should address each of the following points:

1. Problem statement
   - Description of the issue to be addressed (max. 250 words)

2. Current solutions
   - Description of if/ how the problem is currently being addressed, and the shortcomings of these solutions (max. 250 words)

3. A proposed solution **involving AI methodology**

Guiding Points

How AI can help to:

- enhance and customize the learning of every student
- develop students' digital literacy
- reduce teachers' workload so that they can focus on designing good teaching and learning experiences
- and many other possibilities

Submission of Ideation Proposal

1. The deadline for the submission of proposals is on **4 April 2024, Thursday.**

2. PDF your proposal and email it to helmiaty_mohamad_amin@moe.edu.sg.
   Please include the following in your email title:

   NTC 2024 Ideation Proposal_<School Name>_<Group Number>

PHASE 1 – IDEATION PROPOSAL SUBMISSION

1. Problem Statement

Descriptions of the issue to be addressed (max. 250 words)

A key element of the process of learning is asking clarifying and inquisitive questions and receiving answers. With class sizes of >30 and so much syllabus to cover students do not get the opportunity to ask questions and teachers may not have the time to answer all questions.

Also, some students are shy and may not be forthcoming in asking questions or clarifying their doubts in class. Sometimes many students may not be attentive in all classes and miss out on clarifying their doubts in class.

On the other hand, it will be helpful for teachers to have an assistant to help create more practice questions that can help internalize the topics deeply. The questions need to be suitable for the students level and based on a syllabus. We need the questions to be also primarily based on what has been taught in class. The answers to these questions also need to be verifiable as correct/wrong and provide relevant helpful feedback.

We build a solution that can address these problems.

2. Current Solutions

Descriptions of if/ how the problem is currently being addressed, and the shortcomings of these solutions (max 250 words)

Many students go to tuition centers for practically every subject enriching what they are already studying in school. Those who are shy and introverted may not benefit from this also. Tuition centers usually have their own methods and materials for teaching which do not necessarily inspire question-answering and out of the box thinking. Also, not everyone can afford tuition.

There are also educational apps which provide a larger curated collection of questions to answer. The students get exposed to more variety of questions

but that may not address their questions from class on the topic they have heard or allow for a conversation.

Recently, with the advent of Generative AI several online apps like StudyGPT are available. They are based on information primarily available on the web and online books etc. Thus the information provided is not validated for its quality and in many cases these tools can hallucinate. These apps are also not personalized to answer specific questions the student may have on a topic covered in class.

We need solutions that are personalized and have contextual knowledge of the students syllabus and learning habits.

3. Proposed Solution involving AI methodology

First of all we will conduct a survey seeking answers from other students and teachers about specific questions. The purpose of this survey is to understand the requirements of the students and teachers that will help us to prioritize and build the features that we want our solution to have. For example, if most students need help in MT, we will prioritize a solution for MT. Similarly, the questions from teachers are meant to understand how we can help them.

Link to online survey

First we propose to build a solution that answers questions based on a class as depicted in Figure 1. The solution takes a question in speech and an audio transcript of the class and generates an answer (audio) based on the class.

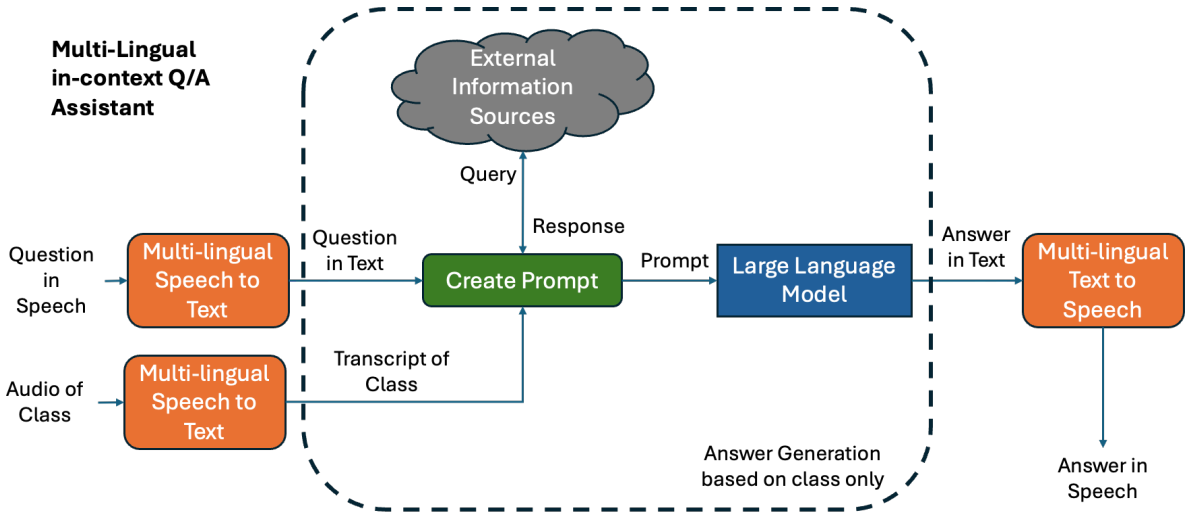

Figure 1: Multi-lingual In-context Q/A assistant where a student can ask questions on a specific class and get answers.

The solution uses a multi-lingual automatic speech recognizer (ASR) to convert the spoken question to text and transcribes the audio to text. It uses the question to extract relevant matching info from the web and combines it with the question and the transcript into a prompt (template). This prompt is sent to the large language model like ChatGPT which generates an answer for the question.

Next, we will build a retrieval augmented generation (RAG) based framework for personalized, contextual Q/A and conversations. The solution takes transcripts of several classes (generated using speech-to-text) and indexes them to make them searchable for information (Fig 2).

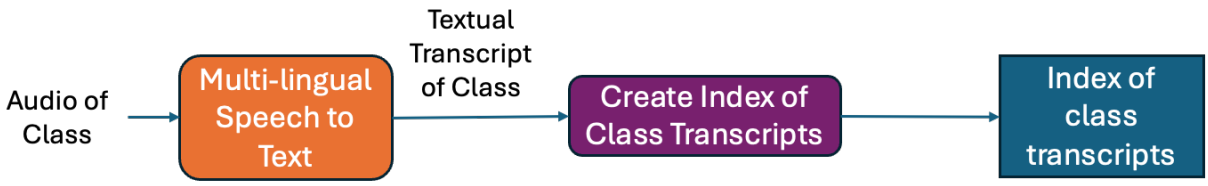

Figure 2: Creating an index of class transcripts

Given a question, the sections from the transcripts relevant to the question can be retrieved. These sections along with the question are packaged as part of a prompt to query a large language model (LLM) for the answer. This RAG framework helps reduce hallucination (the LLM inventing its own ideas) and provides contextual answers (based on the class transcripts) as the LLM will be made to primarily answer the question based on the context (class transcripts) provided as part of the prompt. The solution also allows conversations based on the historical context of what has been asked before so that it is interactive. Figure 3. illustrates a multi-lingual Q/A assistant based on the RAG framework.

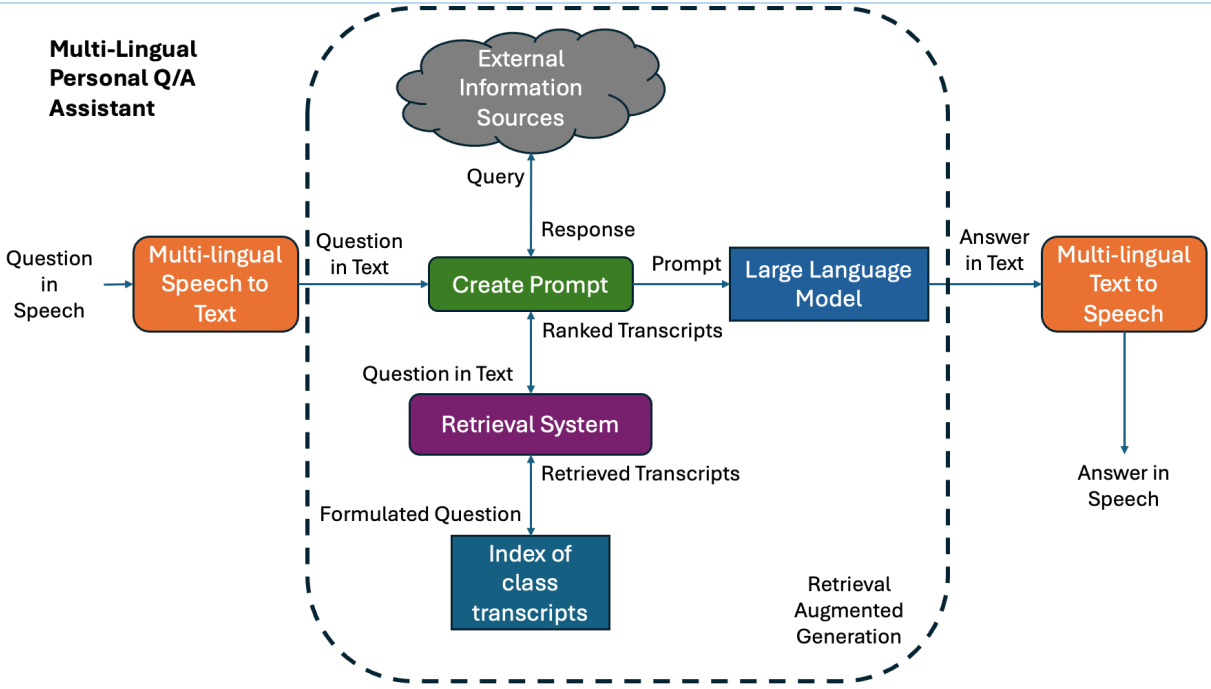

Figure 3: RAG Framework for multi-lingual Q/A assistant: The solution retrieves information relevant to a question from the index and generates answers.

The RAG framework based Q/A solution addresses the problem of shy students who may feel diffident in asking questions or clarifying their doubts. It also improves engagement with the classes.

Our proposed solution also helps generate questions. We propose to build a solution that generates questions based on a class. Used by teachers, the questions generated can be vetted by them.

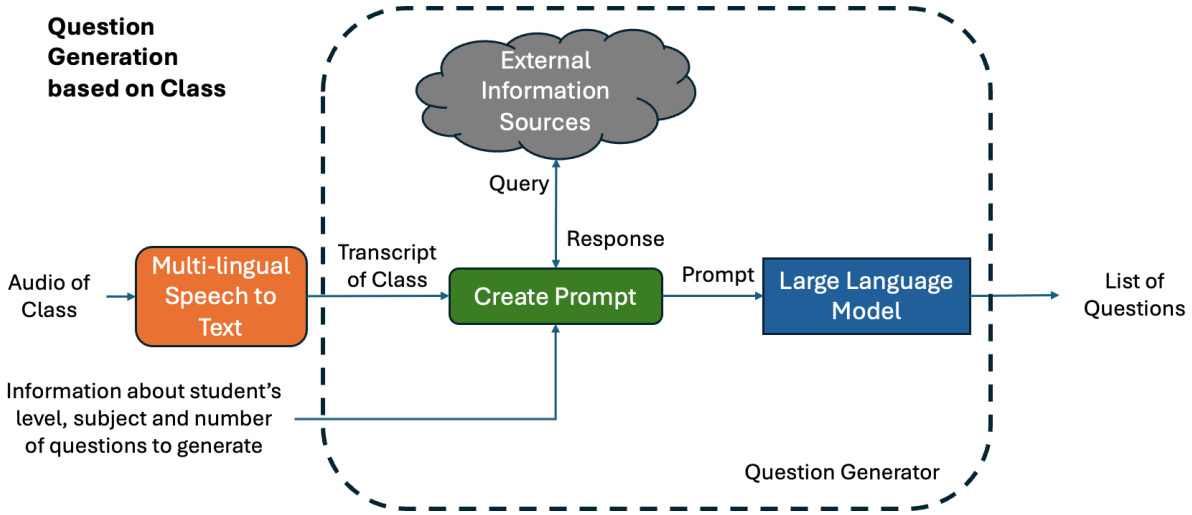

Figure 4: Automated question generation based on class transcript.

Given the transcript of a class, a prompt combines the transcript, the topic of the class, relevant materials on the same topic (from books and external sources), level of the students and topic syllabus to query the LLM for generating a relevant set of questions that are based on the class. **The questions can be curated by teachers before they are provided to students for answering.**

4. Group Details	
School Name	North Vista Primary School
Group Name	
Name of Group Members	1. GOPAL ROY
	2. MOTURI YATIN JAYA CHANDRA
	3. MOTURI JATIN JAYA CHANDRA
	4. SAMYAK JAIN RUPESH
Name of Teacher I/C	Mrs. Tan Huishan & Mr Ralph Ong