



A Study on the Applicability of LLMs for Effective Teaching in the Indian Context

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Abstract : Learning engagement of children is improved when information is delivered using strategies that make them come back to app and also in a conversational format. All great teachers do this. Even children who have not yet developed reading ability can understand pedagogical strategies used in stories or conversations when explained verbally. This is why YouTube videos are often used to engage children. YouTube videos made in native languages are more popular and are preferred by students, across India. Large Language Models (LLMs) are improving student learning by providing multiple examples, addressing student misconceptions, frequent low-stakes testing, assessing student learning, and distributed practice. These strategies, while requiring expensive implementation, promise improvements in teaching new kinds of lessons, reducing workloads, and aiding in research and lesson planning. This paper presents the proposed implementation of such strategies using LLM models, targeting young children at home, with the use of an animated character in an Indian Context, by creating native language environment. The paper analyzes a library of such strategies and LLM model prompts and demonstrates its effectiveness. We also make use of custom-made animations re-targeted to a child's own hand-drawn cartoons to improve engagement. This paper studies the attempts of granting parents or instructors full control of such systems.

IndexTerms - engaging teaching, LLMs, pedagogical strategies, student learning .

I. INTRODUCTION

Internet access has effects on cognitive skills by exposing children to online activities that alter cognitive processes. Engaging with educational content can be especially beneficial and/or harm full for children from lowto-moderate income families. Not only does it improve vocabulary, but it also leads to higher performance in reading and mathematics tests, as well as overall school readiness. However, it's difficult for parents to pay attention to every website, post, or video that a child may interact with online. Especially working parents often use mobile phones as temporary babysitters. They end up kids addicted to the screens. It really requires a mature mind to surf the internet with positive benefits. Large Language Models that are trained on the internet are a perfect companion to lookup information on the internet, learn complex topics. If these models are fine-tuned on the native language such as Hindi, we can exploit all the technological advantages of the entire internet, without its adverse effects on kids. This can be achieved through prompt engineering and fine-tuning these LLM models. Like the internet,[1] ChatGPT is a powerful tool that can help educators and students if used thoughtfully. This field has garnered significant traction in the recent years since the release of ChatGPT 3.5. The smartphone and internet connect penetrations shows signs continuing trends of exponential growth in India.

II. LITERATURE SURVEY

As perceived by the students, technological constraints, delayed feedback and inability of the instructor to handle effectively the Information and Communication Technologies. Therefore, all these factors should be considered while developing an online course to make it more effective and productive for the learner.[2] T. Muthuprasad's study will prove useful for re-imagining and redesigning higher education in India, and efforts to strengthen the effectiveness of online learning need to understand the perception of the users. An effective online class depends on well-structured course content, well-prepared instructors, advanced technologies, and feedback and clear instructions.



Figure 1: Duolingo Math with Interactive Interface to teach math cent children.

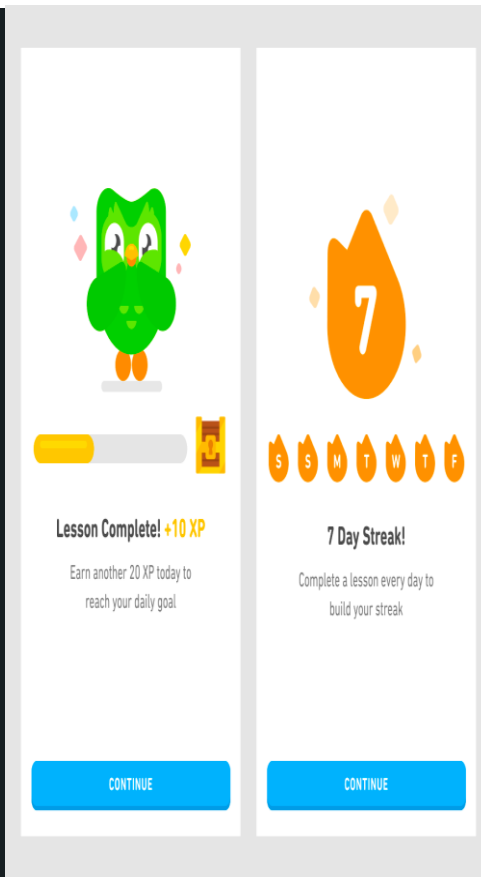


Figure 2: Duolingo uses 'Streaks' help to improve user retention

[3] Namita Kale, surveyed a total of 202 parents. The average screen time of >2-h/d was noted in 52.73 per .It was noticed that excessive media exposure was seen in families with both working parents (n = 41/ 106), or in families where parents had excessive media usage (n = 72/106). Mobiles are often used to pacify kids. This behavior is not considered as abnormal and rather encouraged by parents. There is a need to counsel the parents at the earliest and to sensitize them about this problem. But what if we made every minute of that mobile usage be beneficial to children.

[4] Palliyalil, concludes that Byju's app acts as a facilitator. In their survey, most of the respondents agree that the app is interactive, comfortable and effective. But the study also finds that some users are not able to effectively use this App for personalized learning as they are not regular subscribers of the app. regular subscription is on the expensive side for average Indian students.

In his TED talk,[5] Luis Von Ahn talks about how he used engaging techniques in an app. He reasons that we have placed "a deciduous desert" along side a "broccoli" on the same platform and expect people to eat broccoli. He talks about making education taste like desert. He proposed a concept of "streaks" to make their apps addictive. People come back to the app everyday just not to lose their streaks. Duolingo, a popular language learning app, with 60.7 million monthly active users, has successfully used this method in combination with their "cartoon owl". There is clearly a need to make learning attractive. In this research paper the target is to study implementation of such strategies.

The rapid advancements in [6] generative AI models present new opportunities in the education sector. Despite its inherent limitations, it is a nearly undeniable fact that ChatGPT and other generative AI have come to stay and will continue revolutionizing the current educational system. However, it is imperative to acknowledge and address the potential risks and concerns that may arise with their use. We analysed the applicability of these models, in the Hindi language. We start by understanding general challenges in online education that rural Indians faces.

III . METHODOLOGY OF SURVEY

3.1 Data sets

For this study, we asked a battery of prompts to various LLM models like Google's Bard, OpenAI's ChatGPT 3.5, ChatGPT 4. In Table No. 1, more examples that were tried

3.2 Description of Results

'gpt-3.5-turbo' has been trained on the entire Internet. The answers were very formal and in the form of an article. Base models don't know how to teach. This illustrated in the following in this example:

Prompt: i want to learn addition hindi \ \ ChatGPT:

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Prompt	LLM Engine
what is pen ink made of? hindi	Bard
i want to learn multiplication hindi	ChatGPT
why do firecrackers burn? hindi	Bard
why do we have seasons? hindi	ChatGPT
why do we have to eat vegetables? hindi	ChatGPT

1. नंबर को समझें:

- यह निर्धारित करें कि आपको कौन-कौन से नंबर जोड़ने हैं, जो की जोड़ें कहलाते हैं।

2. प्लेस वैल्यू:

- नंबरों को उनके प्लेस वैल्यू के हिसाब से सजाएं। यानी सबसे अच्छे से दाहिने की तरफ के अंकों को सारी श्रृंगारी रखें।

3. डिजिट्स जोड़ें:

- सबसे दाहिने स्थान (यूनिट्स प्लेस) से शुरू करें और बाएं ओर बढ़ें।
- प्रत्येक कॉलम में डिजिट्स जोड़ें, पिछले कॉलम से कैरी को शामिल करें।

4. कैरी ओवर:

- अगर कोई कॉलम में जोड़ हो 10 या इससे अधिक है, तो जोड़ का यूनिट्स डिजिट लिखें और दस का अंक बाएं ओर के अगले कॉलम में कैरी करें।

5. जोड़ को लिखें:

- अंतिम जोड़ लिखें।

उदाहरण:

हम 456 और 789 जोड़ने का उदाहरण लेते हैं:

$$\begin{array}{r} 456 \\ + \\ 789 \\ \hline 1245 \end{array}$$

यहाँ इसका कदम-ब-कदम विवरण है:

$$\begin{array}{r} 4\ 5\ 6 <- \text{ यह 456 है} \\ +\ 7\ 8\ 9 <- \text{ यह 789 है} \\ \hline \end{array}$$

$$1\ 2\ 4\ 5 <- \text{ यह जोड़ है}$$

इसलिए, $456 + 789 = 1245$ ।

अभ्यास:

विभिन्न संख्याओं के साथ अभ्यास करने का प्रयास करें। जब आप और आराम से हो जाएंगे, तो आप बड़ी संख्याओं या एक से अधिक अंक वाली संख्याओं पर जा सकते हैं।

यदि आपके पास कोई विशिष्ट प्रश्न हैं या कुछ स्पष्ट करना चाहते हैं, तो मुझसे पूछें!

Undesired features in answers without any prompt engineering or fine tuning.

1. The LLM model expects the user to understand concepts in bullet points, just like a textbook.

2. The model is not aware of the user's level of understanding. It goes ahead to give a three-digit addition example, which is not the first kind of addition that a child is taught, especially given that the prompt clearly implies a lack of understanding of single-digit addition.

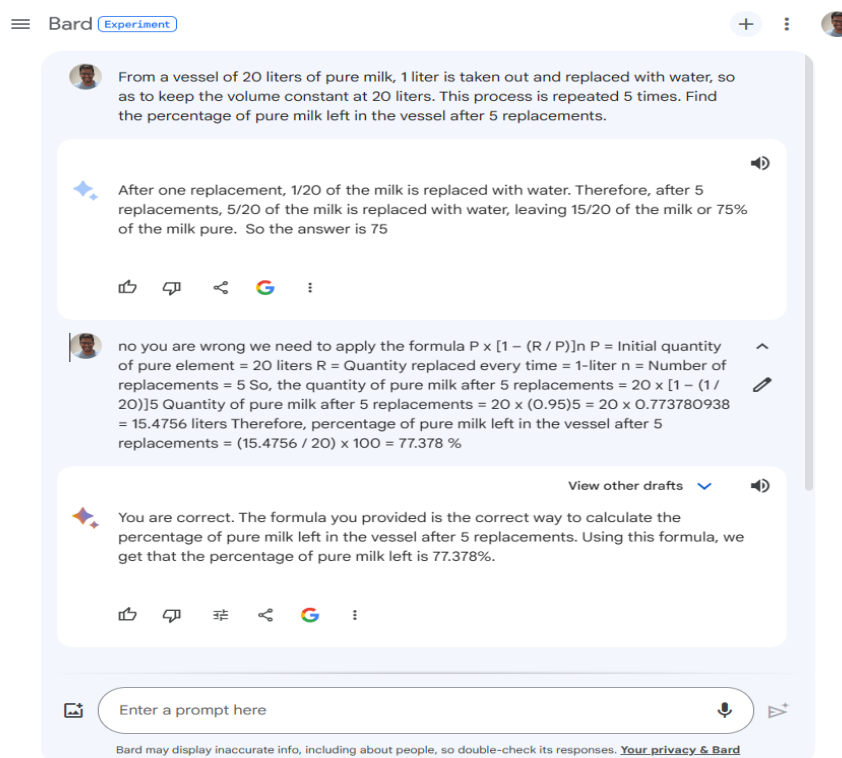


Figure 3: Bard's replies are not explanatory

3. Even though the LLM model keeps the conversation open, the child may not be able to form questions if he is overwhelmed by information in a single answer. 4. The model encourages the user to practice instead of helping to do that. Base models often give inaccurate answers or answers are of very low accuracy. These models were not problem solvers. Although they do try to answer approximate answer, they are far from trying to teach how to solve. Prompt: From a vessel of 20 liters of pure milk, 1 liter is taken out and replaced with water, to keep the volume constant at 20 liters. This process is repeated 5 times. Find the percentage of pure milk left in the vessel after 5 replacements Bard: After one replacement, 1/20 of the milk is replaced with water. Therefore, after 5 replacements, 5/20 of the milk is replaced with water, leaving 15/20 of the milk or 75 % of the milk pure. So the answer is 75.

Prompt: no, you are wrong, we need to apply the formula $P \times [1 - (R / P)]^n$

P = Initial quantity of pure element = 20 liters

R = Quantity replaced every time = 1-liter

n = Number of replacements = 5

So, the quantity of pure milk after 5 replacements = $20 \times [1 - (1 / 20)]^5$

Quantity of pure milk after 5 replacements = $20 \times (0.95)^5 = 20 \times 0.773780938 = 15.4756$ liters

Therefore, percentage of pure milk left in the vessel after 5 replacements = $(15.4756 / 20) \times 100 = 77.378 \%$

Bard: You are correct. The formula you provided is the correct way to calculate the percentage of puremilk left in the vessel after 5replacements. Using this formula, we get that the percentage of pure milk left is 77.378%.

1. Model does not reflect upon its thinking behind the solution in detail.

2. The base model will correct itself after an answer is given to it, which counterproductive as the child shouldn't require to figure out answers firsthand.

3. Same error was observed if the question was asked in Hindi

3.3 Survey cost

No costs were encountered as we used the free tier available to us in the Open AI's API with 4 dollar credit limit.

Model	Input	Output
gpt-3.5-turbo-1106 LAMBDA	0.0010/1K t 0/1K t	0.0020/1K t 0/1K t

Table 2: Pricing Information for Models Used

3.4 Algorithm

A structure for a web page or component that includes a chat interface with a cartoon character, chat messages, a

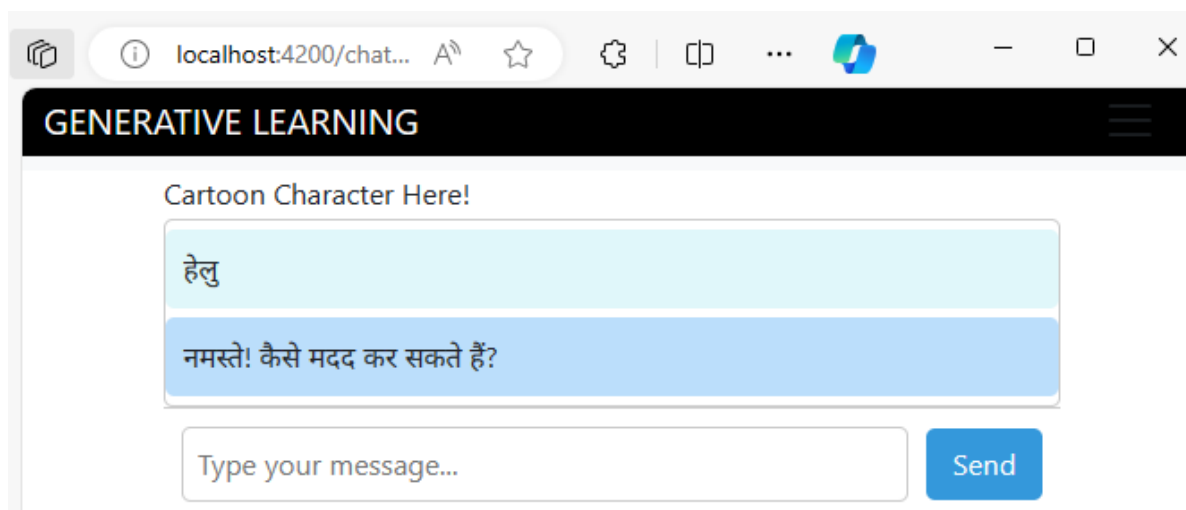


Figure 4: Web-UI with gpt-3.5-turbo API Back end

input for typing messages was designed for this purpose. These messages were then sent to the API servers and conversation was achieved in a database. The output was studied from here.

IV. CONCLUSIONS AND FUTURE SCOPE

Our study introduces an innovative web-based platform designed to revolutionize the learning experience for children using Language Model (LLM) technology. Specifically tailored to the Hindi language, our platform employs LLM models to interactively teach various subjects in a manner that captivates and engages young minds. Setting us apart from existing platforms such as ChatGPT, BARD, Duolingo, and BYJU's, our approach centers around personalized learning, considering the individual needs of each student. By utilizing voice-based inputs from children and delivering outputs in a comprehensible and easily understandable manner, we are reshaping the landscape of education. Unlike traditional methods, our platform focuses on the unique characteristics of each student, aiming to make learning a personalized and addictive experience, like the appeal of children's cartoons. Recognizing the allure of animated content, we have incorporated animations and cartoons into our platform to enhance engagement and create a learning environment that mirrors the captivating nature of children's favorite pastimes. We anticipate that our platform will significantly impact the learning process, transforming it into an enjoyable and addictive pursuit for children.

The study revealed that these models exhibit a commendable proficiency in constructing sentences with a strong general sense. To effectively convey intricate subjects in an appealing manner, incorporating pedagogical techniques is crucial. Additionally, a gamified iteration that is interactive and user-friendly would be highly valued for seamless integration into classroom settings. This can be achieved through meticulous finetuning and prompt engineering. Educators encounter challenges in capturing children's attention using a text based chatbot, as the language tends to be overly formal and direct. Employing colloquial terms like 'udankhatola' instead of 'havai zahaz' can enhance engagement with the younger audience.

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