SOEN 6841 - Software Project Management

Problem Identification Report

Project 20 - Intelligent Tutoring System

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Problem Identification Report

Title: IntelliTutor - An Intelligent Tutoring System (ITS) for enhanced learning

Objective: To research and identify a specific problem or opportunity within the Intelligent Tutoring Systems domain that can be addressed through a software solution.

Content:

PROBLEM/OPPORTUNITY STATEMENT:

The traditional education system lacks the touch of adaptive learning experience, where the student guides their own education. Some students have good grasping power and can understand the topic in one go, but some need more than one explanation to understand the basics of any particular topic. The traditional education system is not a one-size-fits-all approach. Intelligent Tutoring Systems (ITS) addresses the challenge – 'all people are different' and has the ability to develop personalized learning bases and feedback based on their skill level. Another advantage of ITS over traditional systems is its ability to grade assignments or exams, reducing the time spent on it by the teacher. This in turn allows the teacher to be more available to the students and help them with the confusing material.

Currently, there are multiple Intelligent tutoring systems present in today's market, from course platforms like Coursera, which provide multiple courses in many domains, to Carnegie Learning, which acts as a type of one-to-one coach for math, to SAP Litmos, which can be used by companies for employee training. Each of these Intelligent tutoring systems are used for a specific purpose, and their target audience is limited to a certain domain. IntelliTutor is going to be designed in such a way that it can be used by a large group of learners, age range spanning for around 15 years, and the plan is to design it in such a way that it can guide the child throughout all of their development phases in life.

Considering the current ITS available in the market, though being able to personalize the content according to the students' needs and giving the feedback in real-time, they do come with some limitations. Firstly, most of the ITS are focused on one specific subject in the curriculum which makes it challenging to analyze the overall performance of the student. And if there are different ITS for all the subjects, it will become a financial burden for the students. The second issue is that it may reduce the social interaction of the students with each other which can foster social anxiety among them. And lastly, IntelliTutor will address the language barrier by providing tutoring in multiple languages.

STAKEHOLDER ANALYSIS:

1. Students/Children – The primary stakeholders are the students who are directly addressed by the Intelligent Tutoring Systems (ITS). Students stand to gain the most from IntelliTutor as the

learning is tailored to their unique needs, including adapting to their learning paces. By aligning processes to their capabilities and preferences, we will improve student engagement comprehension, and ultimately, academic performance. The proposed solution plans to target children from ages 3 to 18 and will go through every step of their learning journey, from learning alphabets to studying calculus.

2. Parents/Guardians – Parents and guardians are concerned about their child's academic performance. With IntelliTutor, they can monitor the performance of their kid. Parents can gain insights into their child's strengths and weaknesses by using the real-time data generated by the system. They can manage and shape their education as they see fit.

   Apart from this, IntelliTutor can be integrated into the curriculum by educational institutions, where the ITS can provide an additional path of teaching to their students. In this case, 2 more stakeholders will be introduced.

3. Teachers – Teachers play a crucial role in the implementation and effectiveness of ITS. They serve as the architects of its functionality by curating content and structuring learning experiences within the platform. They craft assessments, exercises and learning material that aligns with the students' curriculum. Then, they analyze the data generated by IntelliTutor to gain insights about the students' performance and identify areas for improvement and redefine their instructional approaches accordingly.

4. School Boards – In the light of advances of Artificial Intelligence technology educational institutions are increasingly considering incorporating ITS into their educational frameworks. The emergence of ITS provides the school boards with an opportunity to use AI-powered solutions to improve educational efficacy. By integrating IntelliTutor into their system, the school can improve its students' scores by strengthening their knowledge base.

RELEVANCE TO SOFTWARE SOLUTION:

To solve the problems mentioned in the problem statement, a software solution can be implemented with Intelligent Tutoring Systems, such that these issues are resolved. To address the opportunity found in this domain, the following software solutions will be implemented within IntelliTutor:

1. Multidisciplinary Approach – Content Management System

   Traditional ITS focuses on just one subject within the curriculum, resulting in fragmented learning experience by the students. IntelliTutor aims to provide an integrated learning experience that covers all the subjects. This approach makes it easier to analyze the learning graph of the student and it allows the students to see the interconnectedness of different subjects. For example, all subjects within the curriculum like Math, English, Science, etc. will be catered to within the application for overall development of the concerned stakeholder. Through a

comprehensive Content Management System, it is achievable to include vast amounts of latest curriculum.

2. Study-buddy Feature

   As the learning happens in isolation when using ITS, students tend to reduce their social interaction leading to social anxiety. IntelliTutor will group the students based on their learning graph. This will incorporate communication among the students. For example, IntelliTutor can suggest a student to a buddy with whom he/she can discuss the subject and they can help each other with their doubts. Also, to increase the interaction among students, IntelliTutor will create virtual group projects where students can work together to solve problems. This feature will reduce the feeling of isolation among them. Grouping students together will improve the learning outcomes. Virtual group projects will help them to work in a team developing their teamwork skills which can be useful in their professional settings.

3. Multi-Language Support

   To cater to a diverse and global user base, this application will be provided in multiple languages. Language selection features will be provided so that any user can change the language as required. To make sure the support for multiple languages is properly provided, the development can be done by teaming up with language experts and native speakers so that accurate translations of the content are made.

   Our initial scope of the software solutions includes the following:

1. User Interface/ User Experience (UI/UX): We will design a user-friendly interface so that the students can navigate easily throughout the platform. Also, we will incorporate a visually appealing and responsive design that works well on laptops, mobiles and tablets.

2. Content Management System (CMS): We will develop a CMS to manage and organize the exercises, quizzes, projects etc. As the ITS will cover multiple subjects taught over a large age group, the CMS system will have to be robust and well-built.

3. Adaptive Learning Algorithms: Our aim is to develop an adaptive learning algorithm so that the students can take advantage of the personalized learning experience based on their strengths and weaknesses, which will help them improve their knowledge efficiently. Moreover, this algorithm will dynamically adjust the difficulty of lessons to optimize their learning.

4. Gamification and Motivational Features: We will integrate gamification to increase the motivation among students by giving them rewards or badges. IntelliTutor will recognise and celebrate achievements which will lead to a positive learning environment.

5. Analytics and Reports of the Learner: The plan is to develop analytical tools to track a learner's progress, engagement and performance. The student's monthly progress reports will be sent to

the guardian/parent so that they can remain informed about their child's studies. Similarly, if integrated with a school, the teachers will also receive these insights. Apart from this, real-time analytics will always be available on the application.

6. Study-buddy integration: This feature aims to group the students having similar learning curves together. Using detailed data analytics and understanding the learner's aptitude and speed of grasping concepts, an algorithm will be created to group them together. A discussion forum will be created where these students can discuss their studies and ask questions to their peers.