TEKNOFEST

AEROSPACE AND TECHNOLOGY FESTIVAL

EDUCATION TECHNOLOGIES COMPETITION

PROJECT DETAIL REPORT

PROJECT NAME: SAFE WAY OUT

TEAM NAME: COOL DUO

APPLICATION ID: #473618

Project Detail Report

1. Project Summary:

It is significantly noted that students limit themselves to their classroom syllabus considering it a burden and never think of pursuing knowledge outside of their course. We have targeted this problem, and plan to build a site in which, through various APIs, as well as our own designed database tables, we will enable students to acquire out-of-the-box knowledge of books, sites, research, software, etc. related to various subjects. Our site will also incorporate tools like grammar correctors and step-by-step equation solvers to provide students with an all-in-one tool. On the other hand, a fire, tsunami, or any natural disaster occurs, there is little time to escape. Disasters can double their size in seconds, can rage out of control, and can fill the area with utmost panic; even a little mistake can prove to be fatal. In these cases of life-threatening situations, there is a chance that the mind of a person becomes incapable of thinking of a way out. The system framework of the emergency drill game is first designed for game-based training. Thus, a convenient and accessible game was developed covering a wide variety of emergency scenarios (fire, smoke hazard, earthquake), and step-wise instructions are provided. Through the drills, it has been observed that the evacuation time decreased from 2minute to 45seconds, and the safety scores of the students improved from 60% to 81%. Consequently, game-based virtual Emergency drills made using unity can play an important role in improving evacuation ability and Emergency response skills

Many algorithms and flowcharts were designed which allowed us to work on the site and plan it out effectively in an organized way. Then, detailed research was done to determine which technologies would serve our purpose. We have used HTML, CSS, BootStrap, and JavaScipt, along with several libraries associated with them like Semantic CSS, BootStrap, Vue.js, Jquery, etc. We also needed other dependencies like Python and Node JS along with Git Bash, Google, Watson, AirTable, AstronomyAPI, et cetera. After all, applications were created, set up, and brought into running, we ran them on local servers and embedded them all into our site with local server links.

“The tediously outdated education system that forces students down the path of rote-learning teaches them less about defense as well as overall practical life and extinguishes the thirst for knowledge in them. We aim to change that through utilizing our skills to the very limit.”

(2022, Educational Technologies, High School, Cool Duo Team)

2. Problem/ Issue:

2.1. Lack of Practice in Emergency Drills

An average of 358,500 people experience deadly disasters each year. How children behave in high-pressure situations, such as fire or natural disasters, can vary but this factor can be hugely important when it comes to effective evacuation. Different methods are used in such types of drills today. These can be listed as presentations, videos, demonstrations, or experiments, but they have short attention spans and don’t create enough emotional impact among children unless the subject is gamified. Emergency response skills are important to master thus A digital game should be prepared, with a diversity of disaster scenarios with instructions provided on how the situation should be handled in accordance with the regulation and safety rules. e-learning platforms and software help children remember information more clearly, create a sense of responsibility, foster interaction when playing in groups, and improve their capabilities to solve problems by having an opportunity to learn, practice, and build confidence. Also, research indicates that well-planned drills don’t increase anxiety in children as long as they are announced, and unnecessary theatrics are avoided. Physical drills lack

practical exercise. Students only learn "what to do", but they cannot really understand "how to do it". This project shows that the opportunities for practical exercise, interest, and achievement of students can be improved by using game-based learning combined with high interaction and high feedback.

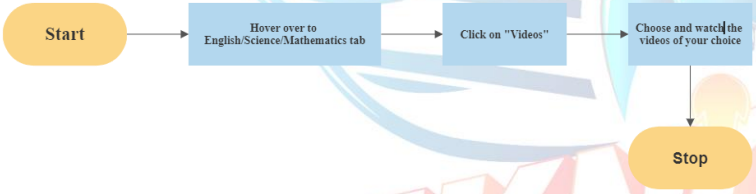
2.2. Lack of All-in-one Educational Websites

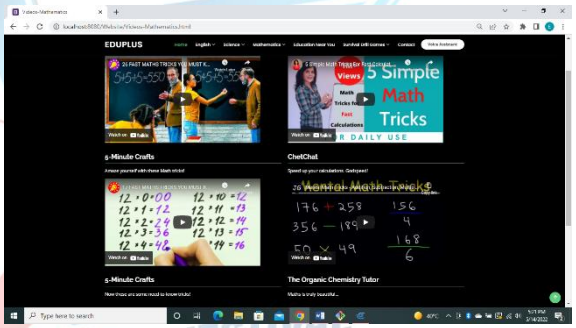
The Internet is a rich source of information, and more and more people make information available online. One day, the knowledge from the internet will be more than teachers alone can provide. Obviously, the traditional teaching and unilateral knowledge acquisition have not attracted the attention of young people, and cannot fulfill the needs of the information society. Because the convenience of network and interactivity results in increasing time and location flexibility, e-learning has become the development trend in education and learning. No such all-in-one tool exists from which students can take help in solving equations, making their essays effective, acquiring important general knowledge through an interactive interface, exploring the vastness of space, and learning fundamental survival skills (and more) all at the same time.

3. Solution

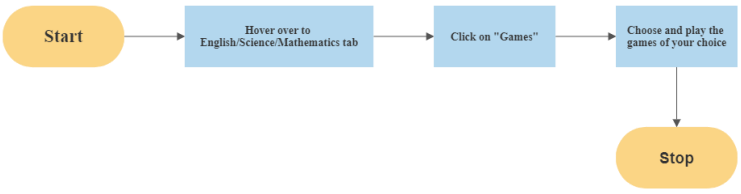
3.1. Tools: This tab includes all the captivating features that our site provides for students.

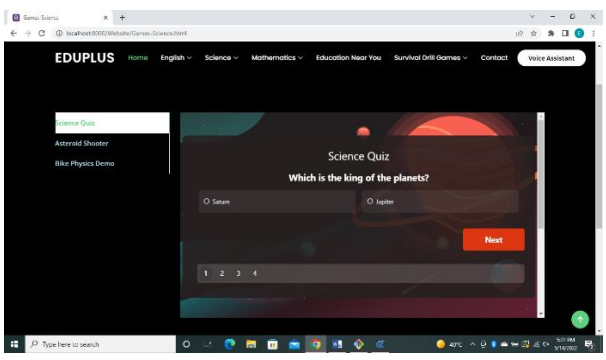
3.1.1. STEM Videos: Platforms of video sharing such as YouTube are filled with all types of content including education. However, the collection is so vast that it can be tedious to choose the best and most effective content. It is for this reason that our site has this feature; to include only those videos that are most effective in providing knowledge, and are of high quality. Partnering up with quality content creators can also lead to profit and advertisement.



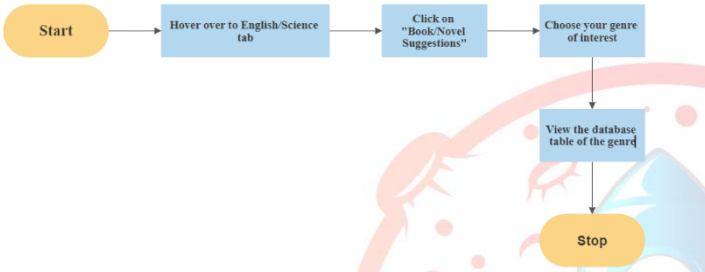


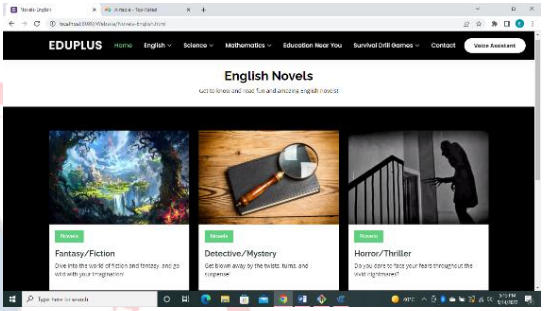
3.1.2. STEM Games: simulations and games can increase students' motivation for science learning, deepen their understanding of important science concepts, improve their science process skills, and advance other important learning goals. We aim to create and include only those games which are not only useful with respect to education, but are also entertaining since that is what will keep the young audience engaged, and that is what will result in maximum effectiveness.



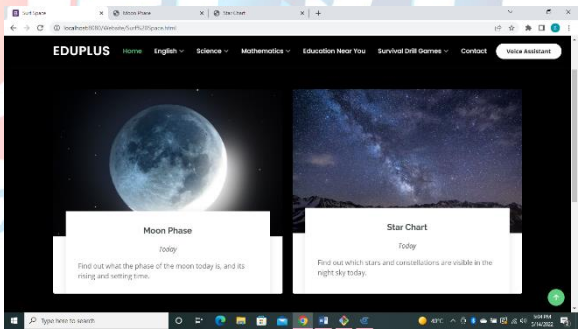


3.1.3. Novel/Book Suggestions: *"There is no friend as loyal as a book"* Reading has many benefits one of them is it teaches you new words and perspectives. It helps strengthen language and sharpens sentence structure. Students may have trouble finding a good book of their choice and genre in public libraries and this is where our site will play its part in providing a collection of the best books available online of that specific genre and will make recommendations based on what you've already read. Eduplus will also highlights what's trending and new releases that are coming out. You just type in a book you like or that you've read, and it populates a list of similar books. They have also been sorted in accordance with age, so that younger audiences may only know about the best books which are age-friendly for them as well. Eduplus has future plans to include a flourishing foreign language bookshelf too in order to captivate young audiences all over the globe.

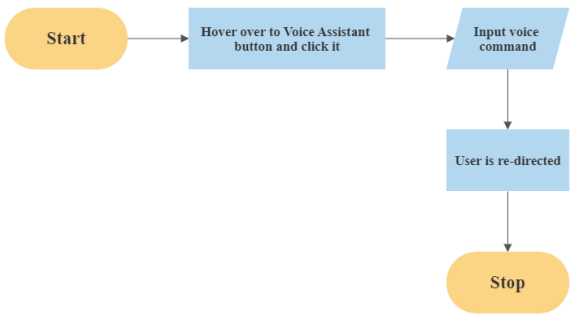


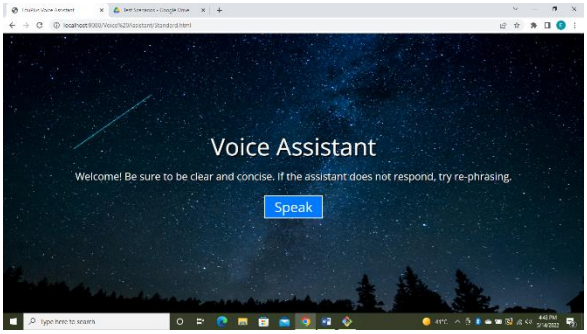


3.1.4. Exploring Space: Space education is not given due regard, and limited knowledge of it is provided in classrooms. We aim to change that by adding two features: Moon Phase and Star Chart. The Moon Phase feature is similar to the one found in the educational website "The Old Farmer's Almanac". It will allow the students to know in what phase the moon is at a particular time, while the Star Chart feature will enable them to know what stars and constellations can be seen at that particular time in the night sky. By gaining such knowledge, interest in this field can be popularised.

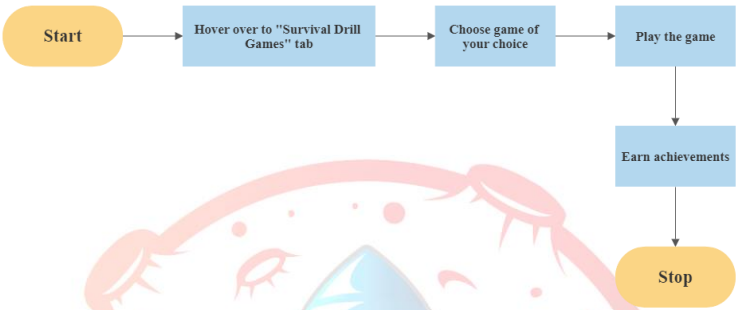


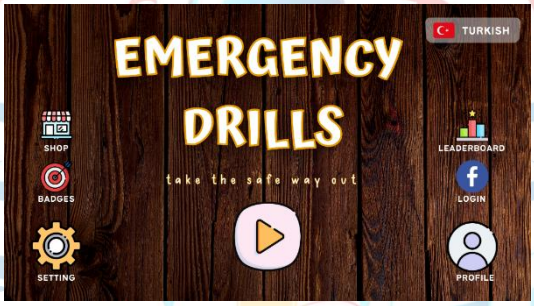
3.1.5. Voice Assistant: A voice assistant has been programmed by us in order to make the site even more interactive and user-friendly which can swiftly re-direct users as per their needs.

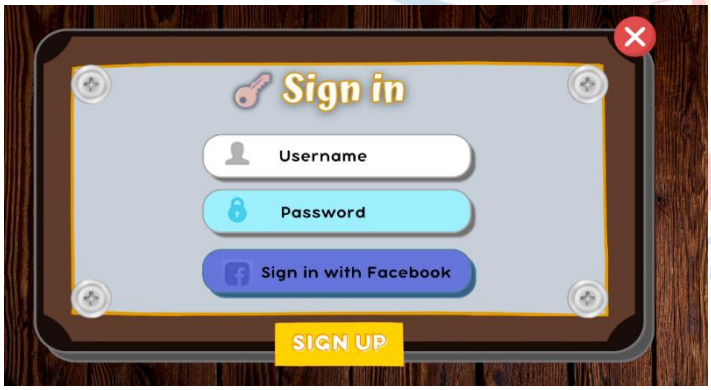


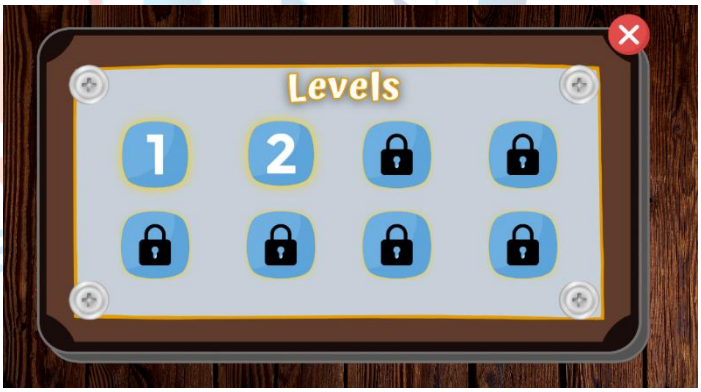


3.1.6. Survival Drill Games: Survival drills of disasters conducted through 3D games depicting real-time scenarios are immersive and help students to interact with the simulated environment. Using smartphones, tablets, or laptops, students can play this game to learn and ensure their survival in threatening conditions. For students' motivation, there will be a scoreboard showing how they have performed so far and after every level of a game, badges will be awarded, and after completing their training, as a token of appreciation digital certificate will be given. The software can be easily used by students and can attract their attention in the most efficient way without getting them bored or distracted.

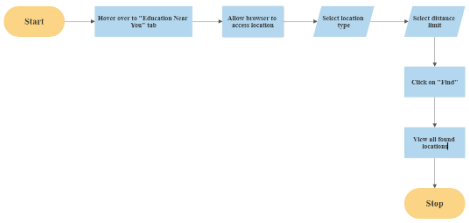


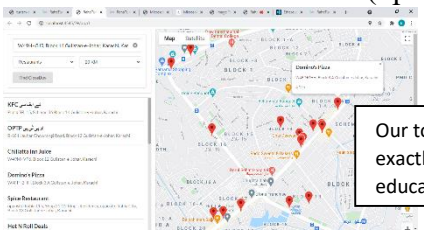






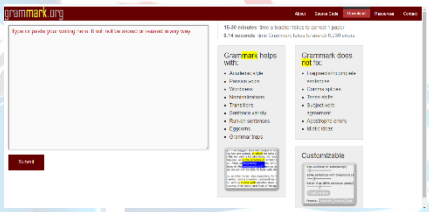
3.1.7. Nearby Educational Landmarks: There are numerous kinds of educational places such as primary schools, secondary schools, universities, libraries, and book stores, and the need for any may arise at any time. This feature of our site is even more straightforward than Google in which literally all types of places can be located. Our site narrows its search and focus to only educational places, and also only those educational places which are near the user's current location (up to 20km).



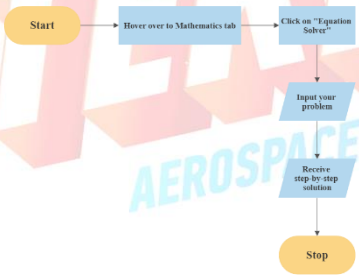


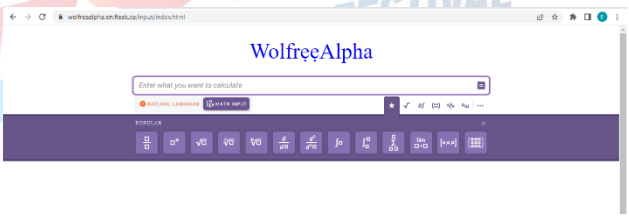
Our tool will work and look exactly this way, but locate educational sites.

3.1.8. Writing Enhancer: Writing essays, applications, and letters by keeping in mind all the rules and conventions of grammar such as punctuation, capitalization, and spelling can be a challenging task for students sometimes. A guide that can proofread your text to make sure it is precise and free of mistakes come in handy for students. For this purpose, the Grammark writing enhancer incorporated into our website can help students make their writings effective by checking and providing suggestions for transitional phrases, reducing wordiness, correcting grammar errors, and much more.



3.1.9. Equation Solver: Mathematics is a subject commonly found to be disliked among students because it is primarily about reasoning, not memorization. They have problems coming up with proper solutions and steps to solve equations and it has been observed that in traditional teaching students are told to cram instead of understanding why particular steps are taken for solving equations. Wolfram Alpha equation solver incorporated in our site allows students to develop understanding and also explain the processes used to arrive at solutions, rather than remembering and applying procedures.

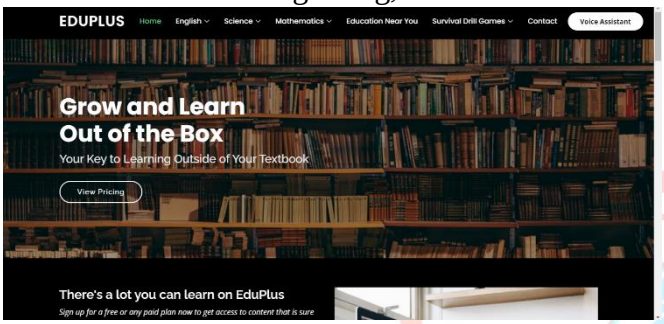


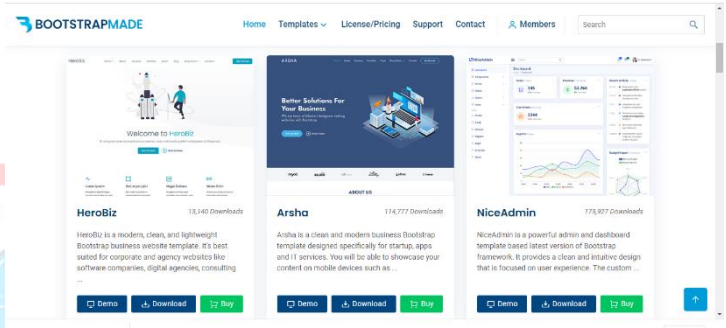


Problem	Solution	Contribution in Education
Need for knowledge beyond the limit of the classroom, for learning survival skills useful during disasters, and for locating nearby educational places quickly and easily.	Solved through STEM games and videos, book selections, API for space education, locating nearby educational landmarks feature, survival drill games, virtual assistant, and other tools.	Will result in a tool that not only proves to be educational in an entertaining and effective way, but also provides knowledge needed by youngsters in the long run.

4. Method

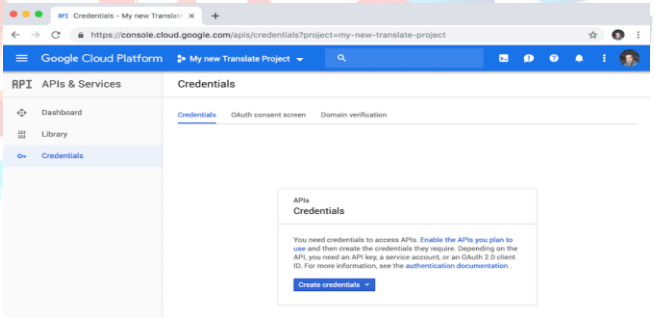
4.1. The Home Page: The professional, responsive, and functional design of our website is based on a BootStrap Made template which was then edited in various ways to serve our requirements. Its design is based on HTML, CSS, and JavaScript, along with the utilization of many other libraries such as IcoFont, Boxicon, remixicon, and AOS, Font Awesome (CSS libraries), as well as Jquery along with its library counterup (JavaScript library), and obviously, BootStrap. Our Home Page is associated with a Virtual Assistant, built with IBM Cloud service known as Watson Assistant API. We created its database from the beginning, and then Watson services provided us with code to embed it.



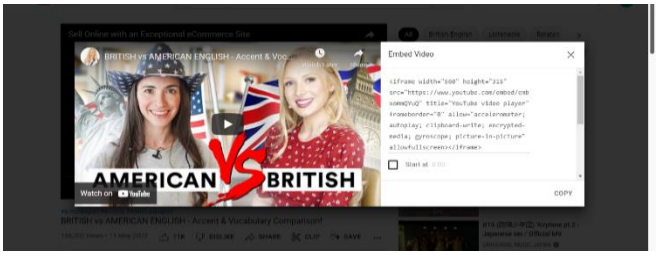


4.2.Features:

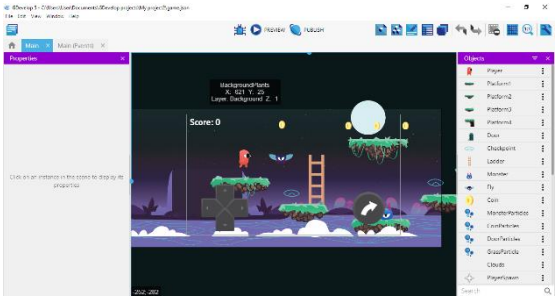
4.2.1. Educational Places: For this, the main services that were used were Vue.js, and two Google APIs known as Maps JavaScript API and Google Places API. One must create a Google Developer Console account and enable the required APIs to use Google APIs. An API key will then be provided which must be entered into the code in order for it to function. A CSS library called Semantic CSS was also used. The nearby Book Stores, Libraries, Universities, Secondary and Primary Schools features use Vue.js, Axios, Smenatic CSS, Maps JavaScript, and Google Places API. The template was first designed in Vue.js and the neat and beautiful look was provided with Semantic CSS. JavaScript was then used to code functions and methods that send instructions in order to utilize and receive data from Google services which would then be displayed to the user according to the information requested by them. We tested it various times in different locations, and each time it displayed accurate results.



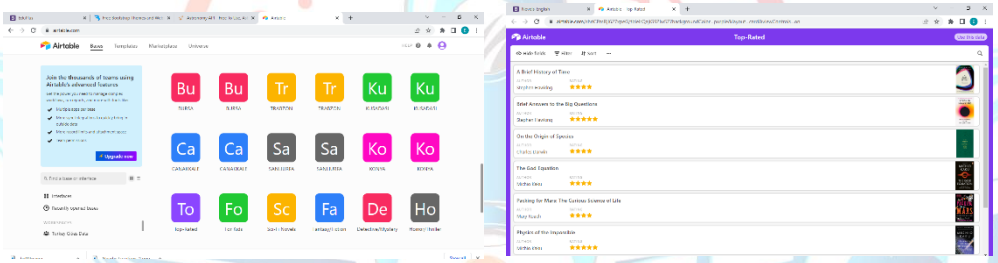
4.2.2. STEM Videos: The pages themselves in which these videos are embedded have been created with the same technology applications as the Home page, and the simple tag of iframe has been used in order to embed knowledgeable and interactive YouTube videos according to each subject.



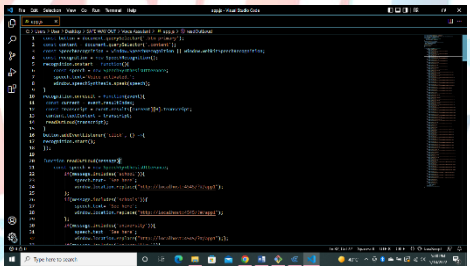
4.2.3. STEM Games: Again, the pages have been created with Home page technology applications, and the games, for now, have been made with the relatively simple software of GDevelop. There is a menu to the side with options that state the names of the game and these options have functionality. Clicking on one option makes the respective game appear, and clicking on the next makes the previous one disappear and the respective one appear in its place. We tried playing them and they worked fine.



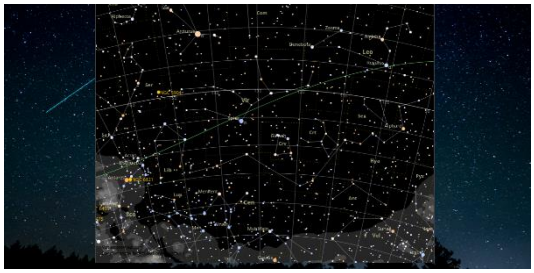
4.2.4. English/Science Books: AirTable has been used to create database tables of various kinds of English novels and Science books. The simple and interactive interface of AirTable made our job easy. The tables and book selections are limited for the purpose that our project is a prototype. Also, instead of embedding the tables within a webpage which would provide a cramped and hard to control interface, we added the target:_blank property in the <a> tags so that the tables would open in a newtab.



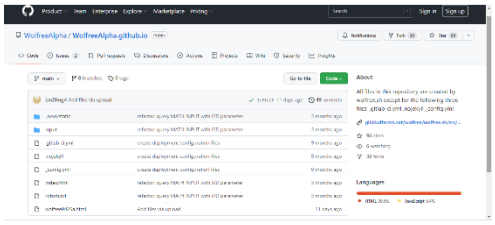
4.2.5. Voice Assistant: Our voice assistant is based on JavaScript and a browser's speech recognition API. The code for it is purely based on simple IF statements. We issued various commands to it and each time it redirected us to the accurate page.

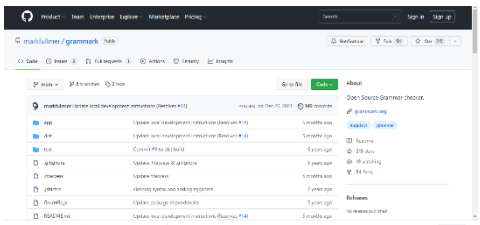


4.2.6. Surf Space: We have used the AstronomyAPI GitHub repository for this feature. One has to sign up for this API, generate credentials, and create a hash in the code that refers to our credentials in order to receive results through the API calls. The outcome we receive for both the Moon Phase feature, as well as the Star Chart feature, is in JPEG format. We tried using both its moon phase and star chart features various times on different dates, and each time, they worked.



4.2.7. Writing Enhancer and Equation Solver: They are both included in our site through cloning and required editing of the code of their respective open-source GitHub repositories. We tested them both by providing them with our own composed essays/equations from our textbook, and each time they both provided us with satisfactory results.





4.2.8. Survival Drill Games:

4.2.8.1. System Design: Emergency Drill game has been developed using the ARCS model to analyze the learning motivation of students. This game includes three main functions: registration/login, evacuation drill, and result feedback. Firstly, students need to register or log into the game, from where their basic information (e.g., usernames and IDs) can be collected. Secondly, they can perform the virtual evacuation drill using the game and they are made to face several scenarios ranging from simple to complicated ones in the games. In this process, the game records the drill data of the students, such as the evacuation time, effective options, and how many trials they performed.

4.2.8.2. Drill Process: students observe the emergency scenes with a first-person view and control the evacuation movement (e.g., moving, turning, and speeding up) through the keyboard or touch screen. In this way, they can experience a realistic emergency scene and can make decisions after analyzing a situation. In every scenario, options are provided to students to choose the correct one they think, if the answer proves to be correct the reason is given to make students fully understand the proper step which has been taken and also to correct them if they have selected the wrong option. All the steps are provided in accordance with the regulation and safety rules. Using Lumion and 3ds max Free 3D model from websites such as CGTrader and unity asset store virtual interactive scenarios were developed for the game. To create interaction in the virtual environment, script language C# is used.

5. Innovative Aspect

5.1. What's New: As per our research, no educational platform comprises this many features for its users. Our site is an all-in-one tool for young users who want to explore the world of knowledge beyond their classrooms. Even though each feature of our website is already existing on different platforms, making them all accessible on a simple, straightforward, and interactive platform is in itself our greatest innovative aspect.

5.2. Emergency Drills: In current times, traditional disaster drills are impractical because recreating an emergency to carry out safety drills for students is more expensive, time-consuming and they have a short attention span thus don't create enough emotional impact among children unless the subject is gamified. Such gamified versions of drills have already been made for Virtual Reality Systems (VRs), but VR equipment is expensive and not accessible by all. We aim to convey knowledge of how to survive during disasters through games that can easily be played through accessible devices like laptops, tablets, mobiles, etc. This is the aspect that makes our survival drill games unique as compared to the ones existing for VRs.

5.3. STEM Videos and Games: Various websites are hubs of games including those which are educational, while YouTube is the most popular video-sharing platform which can offer you all sorts of interactive videos that provide education. However, having to look for high-quality and impactful content by sorting and filtering it out is a must in order to receive important and useful knowledge. Our website eliminates the need of having to look for top-tier educational content on platforms with abundant content since it will only display the best knowledgable content from our partner creators.

5.4. Voice Assistant: This assistant can navigate the user to any page of the website according to the commands issued by the voice of the user. Its design and way of working is different than other typical voice assistants that simply respond with automated messages, or direct the user to a human agent that is capable of helping out the user with his/her query.

5.5. Locating Education Near You: Google Maps, Waze, etc. do enable us to search all kinds of landmarks both dependent and independent of the user's location, but this feature of our site narrows its search to only educational landmarks within upto 20km distance of the user's location so that he/she can visit any desired educational landmark that is not too far from their own current location.

5.6. Selection of Books and Novels: There might be APIs with a vast selection of books, but our innovation in this aspect is that we have created our own database tables of books and novels which are best according to our own judgments, and sorted them in our own subcategories that we have created. We have tried to keep some database tables of books age-friendly for young children.

5.7. Shooting the Night Sky: Stellarium is the best example of an online as well as a desktop star chart. Utilizing their or AstronomyAPI's GitHub repository in itself is not innovative, however, we decided to include it on our site, so that besides users of Stellarium that are mostly astronomy students, exposure to such a star chart may also be given to young users who are not provided sufficient space education in their classrooms. This will popularise the field of space education among them, and motivate and encourage them to pursue this field.

5.8. Smart Platform: Our site smartly provides all features a student passionate about knowledge might need. The easy interface, many tools, interactive learning techniques, all can be found on our website.

5.9. Language Support: We have included the code of Google Translate Element on our site, allowing users that do not speak English to translate the website into their native language, so that they can have an understanding of our site and its features.

5.10. Writing Enhancer and Equation Solver: Essay modifiers and equation solvers are existing technologies. Infact, we have embedded them from existing sources. However, including them as a feature of our all-in-one tool is part of our innovative scheme.

TOOL COMPARISON

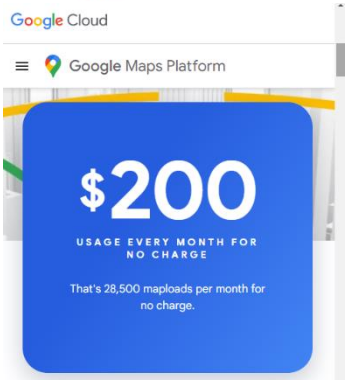
FEATURES	WEBSITES			
	EduPlus	Funbrain	Brainpop	Adventure Academy
• STEM Videos	✓	✓	✓	✓
• STEM Games	✓	✓	✓	✓
• Books	✓	✓	✓	✗
• Space Education	✓	✗	✓	✗
• Locating Educational Landmarks	✓	✗	✗	✗
• Survival Drill Games	✓	✗	✗	✗
• Writing Enhancer/Equation Solver	✓	✗	✗	✗
• User-friendly	✓	✗	✓	✓
• For a vast age group	✓	✗	✗	✗

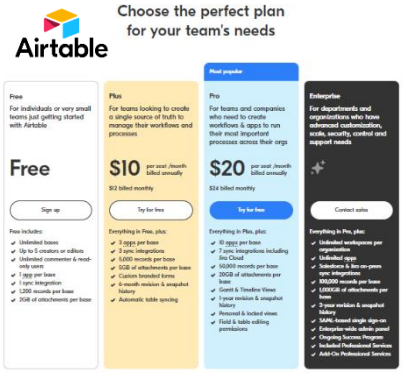
6. Applicability

6.1. The Website Itself: For now, we are running our site by creating a NodeJS server as well as through ngrok by creating timed sessions, but if our site is to be globalized and be made available to the public, we would first have to purchase a domain with the name we desire. We would have to register with some search engines and have proper SEO management done for our site. Then, we would have to choose a powerful web host.

6.2. Locating Educational Landmarks Tool: We are using Google Cloud Platform's free trial for this prototype for development purposes only. Google offers separate plans for product producers which are a bit high in price, and the price is on a monthly basis. The plan that best suits our needs as a producer will have to be selected so that this tool can become a commercial product.

6.3. Book Suggestions Database Tables: As stated above, the database tables for book suggestions that we have designed are very limited and only for prototype purposes. We would have to add vast varieties of genres and add a large selection of books in each of them in order to provide our users with ample suggestions. This can either be done through database managers that would be responsible for keeping these tables full of variety as well as updated, or we can try looking for APIs of services that already have a large selection of books stored. Additionally, AirTable also has pricing plans.



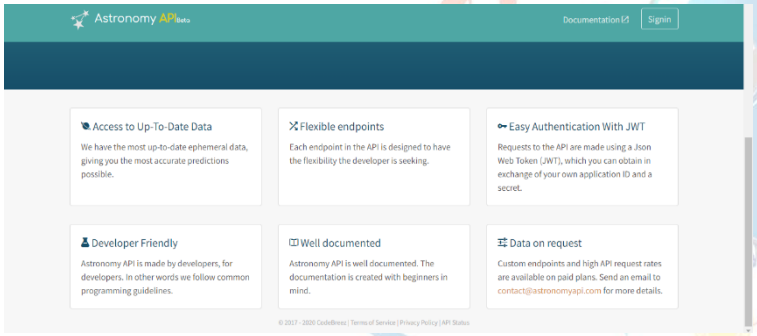


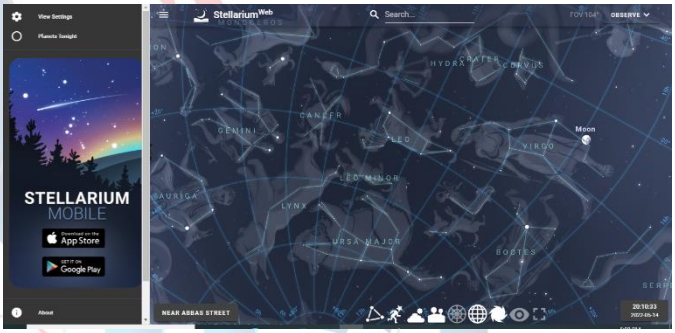
6.4. STEM Videos: At this moment, we have embedded random YouTube videos related to a particular subject in our website. As our site becomes a commercial product, we can partner up with

multiple educational content creators on YouTube. We would promote their videos by displaying them to the users of our website, while they can advertise our website through the content that they post on YouTube, just like hundreds of content creators that include short advertisements in their videos of a product that sponsors or benefits them.

6.5. STEM Games: Simple games made with GDevelop have been used by us at the moment for this feature. Just like in STEM videos, we can partner up with various educational game creators whose games we would include in our site for a price.

6.6. Space Simulation: This feature of our website responds to the API calls by providing information in JPEG format. We have used it on a free plan, but the API offers paid commercial plans. Although this has made this feature functional, it doesn't give the user much to interact with. This feature can be made even better by including navigable star charts such as the one in Stellarium Web Engine. Such a star chart will enable the user to search any constellation, planet, galaxy, or even a single star out of about 2 billion included in the software, and can provide minute details of any of them. It can also the display equatorial grid, azimuthal grid, etc. of the sky. Otherwise, displaying only pictures may result in disappointment for the user if he is paying for such a commercial product.





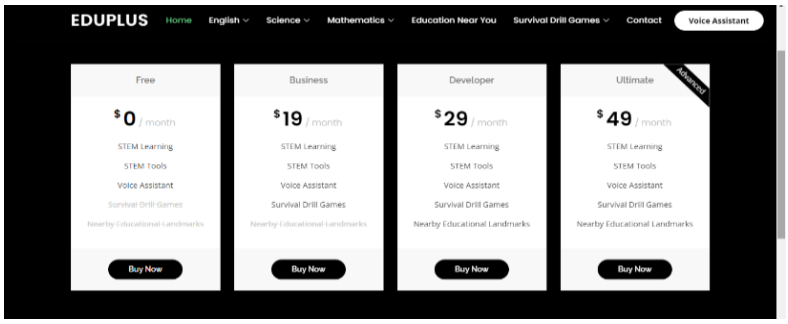
6.7. Site Assistants: Our site assistants, both voice-based and one made through Watson API, are not very professional as they have been created only for the purpose of development. They will be made professional only through complex functionality that can deal with nested logical operations. Only then can they be a part of our commercial product otherwise they won't prove to be very user-friendly.

6.8. Writing Enhancer and Equation Solver: They both are features ready to be run on both a private or public host, and their owners have not included any price for the ones who use them. However, we will still provide credit to the owners by not removing their names such as Wolfram Alpha (equation solver), and Grammark (writing enhancer).

6.9. Survival Games: The Unity game can run across multiple platforms such as Windows, Apple, and Android. It can be made ready by presenting it in markets. We may also need paid game assets when we turn our site into a commercial product. We have used only free assets for noe.

6.10. Pricing Plans: Overall, the experience of a user of our website would work in a way that first, he/she would have to select a pricing plan. We would provide both free and premium options. Then, according to the plan subscribed by the user, features would be made available to them. Pricing plans must be affordable as our target audience is mostly young, but simultaneously, it must be profitable for us.

Our site will cause loss only if we don't advertise our site properly, or if we fail to provide users with useful features. Elements that can potentially be a loss if we lack popularity or disappoint our users include: paying for site domain, Google APIs, database managers, or any paid book, assistant, or astronomy API.



7. Estimated cost and Project Scheduling

The costs for the website, as already specified, will be involved purchasing of domain, maintaining paid API services, advertising, as well as for paying database managers if needed. Payments will be on a monthly basis, thus the maximum cost required will not exceed more than one or two grand USD, which will be compensated along with profit through our users.

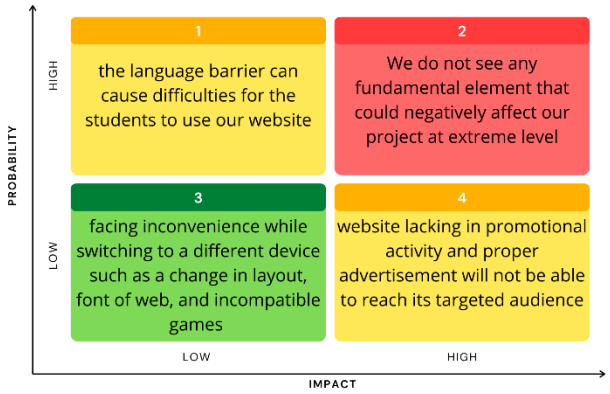
The software of the game to be prepared is 100% by our own means and will be done with 3d objects, on the other hand, it will be covered by free assets as much as possible, paid assets with a budget under 20 dollars. Since our project is a software and design project, hardware and parts costs are not available. gamified versions of drills for Virtual Reality Systems (VRs) carried out by professional software teams and It is priced in the range of 400- 500 dollars depending on their professionalism also VR simulation requires a proper VR headset to work making it more expensive and infeasible.

		YEAR 2022					
	DESCRIPTION	**December**	**January**	**February**	**March**	**April**	**May**
1	LITERATURE REVIEW						
2	ALGORITHM DESIGN						
3	WEB DEVELOPMENT						
4	GAME DEVELOPMENT						
5	COMPLETION						
6	IMPLEMENTATION						
7	TESTING						

8. Target Group of the Project Idea (Users):

Although the ideal target audience is 7-18-year-old students who are intrigued by digital learning and have a suitable education level, there is no firmly defined upper age limit since anyone, no matter how old, might just end up grasping knowledge that could greatly help or benefit them. The 7-year-old group was chosen as a beginner because of being literate and conscious of social issues.

9. Risks:



Solutions for the problems identified above:

1) For students who are non-English speakers, our website and emergency drill game can be translated into their native language so that they can have an understanding of our site and game.

3) Our site will look the same on all devices. The game assets are compatible with all devices regardless of size, resolution, and versions. The game can run on all OS such as Windows, Apple, and Android.

4) Our website has captivating and unique features that are new and useful to our target audience. We plan to introduce our project starting from our district, and by participating in different project competitions and exhibitions regionally or throughout the country. Using social media we can also attract our audience by doing so we will have a good chance of success.

10. Resources

Author's name	Title of article	Date of Article	Date of Access	Address of Access
Cheryl Olson, Sc.D.	9 Benefits of Video Games for Your Child	09-Apr-2014	5-Jan -2022	https://www.parents.com/kids/development/benefits-of-video-games/
Tom Clayton	15 Educational Software Examples 2022	27-Dec-2021	7-Jan -2022	https://rigorousthemes.com/blog/educational-software-examples/
Pavithra Samuel	Importance of APIs in Education	22-Feb-2022	25- Feb - 2022	https://colorwhistle.com/api-importance-in-educational-website/
Raja Tamil	Vue.js + Places API: Build A Nearby Locations App	5-Feb-2020	2-March -2022	https://softauthor.com/vue-js-google-maps-api-build-a-nearby-places-app/
Sonia Schechter	Everything You Need to Know About Using FBX Files	19-March-2020	6-March -2022	https://www.marxentlabs.com/fbx-files/
InsideEdition	How to Safely Put Out a Kitchen Fire	8-May-2018	9-April -2022	https://youtu.be/AFwkGTEles8
Su,Chung-Ho; Cheng, Ching-Hsue	3d game-based learnıng system for improving learning achievement in software engineerıng curriculum	April-2013	18-April -2022	http://www.tojet.net/articles/v12i2/1221.pdf
Yeap, Mei Ling	virtual interior walkthrough using unity3d	15-June-2015	25-April -2022	https://www.academia.edu/18481555/virtual_interior_walkthrough_using_unity3d