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M-LABS an educational take on augmented reality: Application implementation

Rashi Hajari
rashihajari123@gmail.com
Vidyalankar Institute of Technology, Mumbai, Maharashtra

Snehal Andhare
snehal.andhare@vit.edu.in
Vidyalankar Institute of Technology, Mumbai, Maharashtra

Tejan Gavandi
tejan.jack@gmail.com
Vidyalankar Institute of Technology, Mumbai, Maharashtra

Shantanu Shingote
shantanushingote@gmail.com
Vidyalankar Institute of Technology, Mumbai, Maharashtra

ABSTRACT

Augmented Reality (AR) is a view of the physical, real world environment that is augmented by synthetic, computer-generated elements. Augmented reality is a technology that has come into the limelight very recently. From Motion pictures, to magazines, to android or web based applications to gaming and so on it is used. The usage of AR in movies has been prominent. The driving force be- hind us choosing this domain and this particular topic is simple, augmented reality is the future. A reality that is better than reality. The foundation of the society are children, and to augment children's interest it is important to provide them with tech-aided tools. To show them how technology can be made available at their disposal and in return make them think and foster their ideas using this innovative app.

Keywords: *Augmented Reality, application.*

1. INTRODUCTION

M-LABS is our vision of making a children friendly app that can be used in their science labs to make their experience more remember- able and in turn increase their interest. Quality education isn't avail- able in all the schools across our country. And due to this and lack of apparatus, safety measures and an unsafe environment these basic experiments that form the basis of science aren't as clear as they should be. In M-LABS we are going to take a set of 11-16 experiments and demonstrate them using augmented reality how do they actually work through the help of animations and instructions so that the students can see how these experiments are done and what is their results along with all the safety measures taken into consideration so that a student can perform it in his/her house or can teach a fellow student. In rural areas where one teacher teaches and cannot provide the apparatus to each student due to low finances under these conditions this app will prove to be extremely handy that too with just the usage of an internet connected mobile phone.

Augmented reality is the integration of digital information with the user's environment in real time. Unlike virtual reality, which creates a totally artificial environment, augmented reality uses the existing environment and overlays new information on top of it.

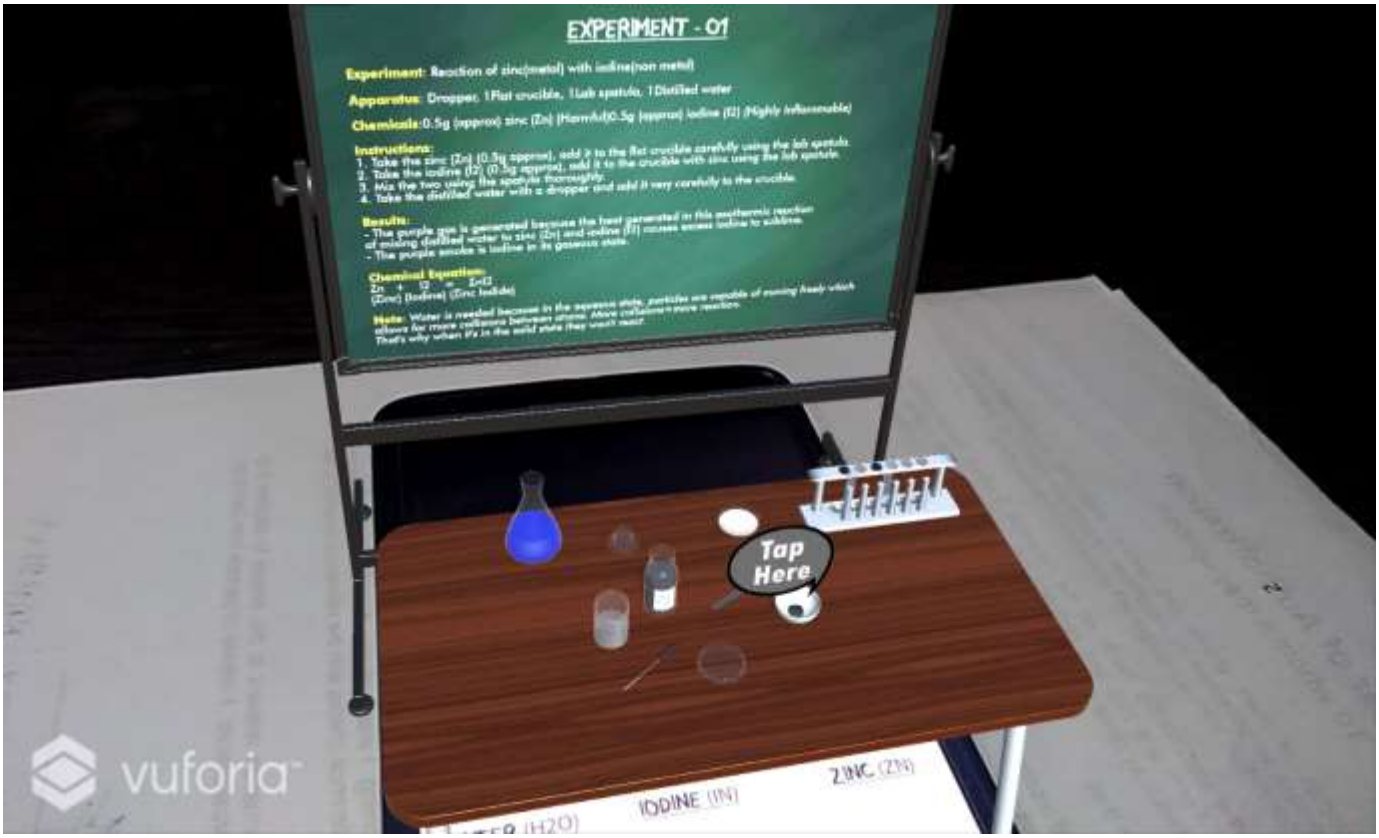


Fig 1: screenshot from the app

In the developed application we have included various experiments from the chemistry domain of science to help schools and colleges and individuals on a very abstract level to actually do the experiments in front of their eyes.Marker-based augmented reality appsMarker-based augmented reality apps differ from location-based apps in a number of ways. Firstly, marker-based AR apps operate by enabling the software to pinpoint particular patterns (this could be a AR target or brand symbol) when used in conjunction with a device camera (usually a smartphone) to overlay digital information upon the real-world environment. This means that when the device user points their smartphone at a particular object or setting, they can see a virtual UI on top of the object. Secondly, if the image in question is either animated or 3D, the digital overlay sits on top of the recognised pattern. These emerging technologies offer enormous potential to software development managers and marketers seeking to extend their existing mobile app offering.

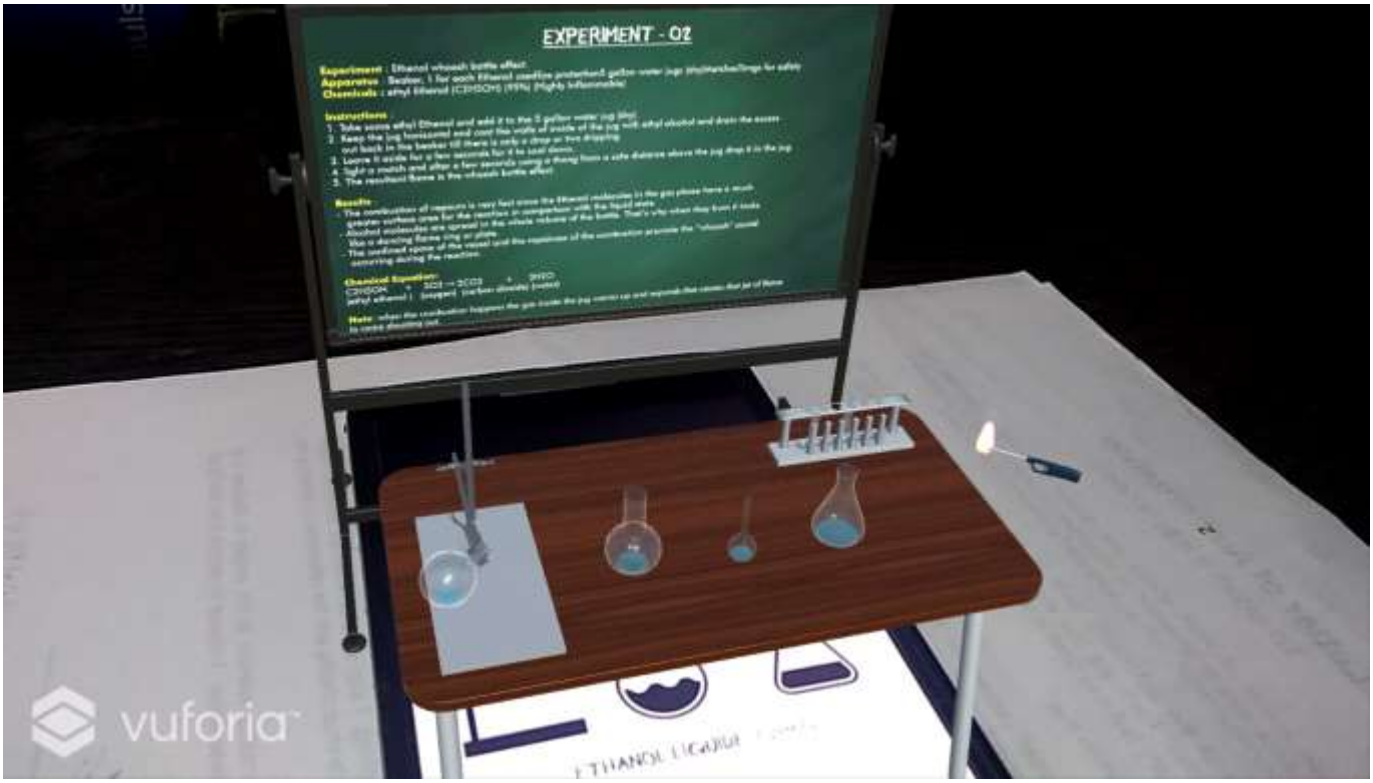


Fig 2: screenshot 2 from the app

3D MODELLING

a. Taking Reference Photos and Measurements

The first step for each product is taking good reference photos. Which was a huge help during the entire process.

b. Modeling

After we have our measurements and scene file set up, we start with a primitive shape (i.e. a sphere, cylinder or cube) and add detail until we have an accurate representation. It's also important to remember that the mesh complexity has to stay relatively low
After the modelling portion is finished, we export two files. One with a low-density mesh, and one with a high-density mesh, and import them into Substance Painter, where we add texture.

c. Painting the Textures

The high-density mesh will be used to generate smooth texture maps.

Fig: app screenshots

Substance Painter will use these initial texture maps for the generation of various effects, like edge wear, scratches and rust.
Then we adjust our Substance Painter viewport to match the environmental lighting the models will be viewed in.
Before the models can be used, they must be exported in a format used by our 3D engine.
The last asset needed is the environment texture. This is a 360 photo that provides information for lighting and reflections.

d. Import the package into Unity

When the 3d objects of our lab were ready, we moved on to importing our package to unity for the further development of our app.

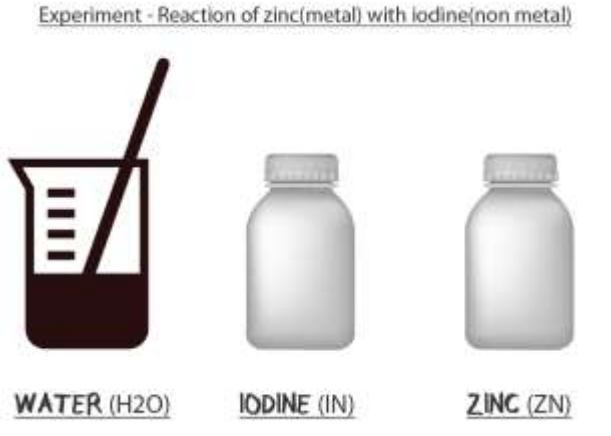


Fig 3: AR target foe the app

e. Adding the markers and uploading it to unity

Observing a few actual apparatus, we modelled 3D replicas of the same using Blender. These models were made to resemble exactly like their lifelike pieces. The models were textured and edited using Blender. After creating the models they were added to the application so as to be used as objects that would be displayed upon the image targets. AR targets were chosen to be Image Targets as they provide with sharper features and thus are easily recognisable and distinguishable by the camera. AR targets have a high recognition rate compared to regular Images and hence provide crisp functioning. An AR target is generated for each experiment, which is recognised by the application and stored into the database.Unity along with Vuforia links each model with its corresponding AR target.

After collecting the models and their respective AR targets the next step is to link all of them into an Android Camera Application so as to run it on the user's device. This is brought about by Unity 3D. Unity 3D provides with a feature to build the scene into an application. It could be for Windows, Android, Ubuntu, Tizen, PS Vita, Xbox One or iOS. Here we have picked it to be an Android Application. Setting up the SDK with the assigned company, build number, minimum and targeted SDK, the application is built.
The user gets the application on his device which takes him to the Unity camera. He needs to then put thecamera on AR target. As the AR target is scanned by the application the corresponding image is recognized and its experiment object is augmented onto it. And since laboratory is available on the user screen user can perform particular experiment and note down the result.

2. APPLICATIONS

- The application can foremost be used by students anywhere.
- The application can be used by teachers to demonstrate experiments that are too hazardous or dangerous.

- The application can be used by schools in rural areas who do not have enough capital to bring in the apparatus.
- The application can be used by any parent/teacher/tutor/guardian for explaining anything to a particular student.
- can be used by anybody with a thirst for knowledge.

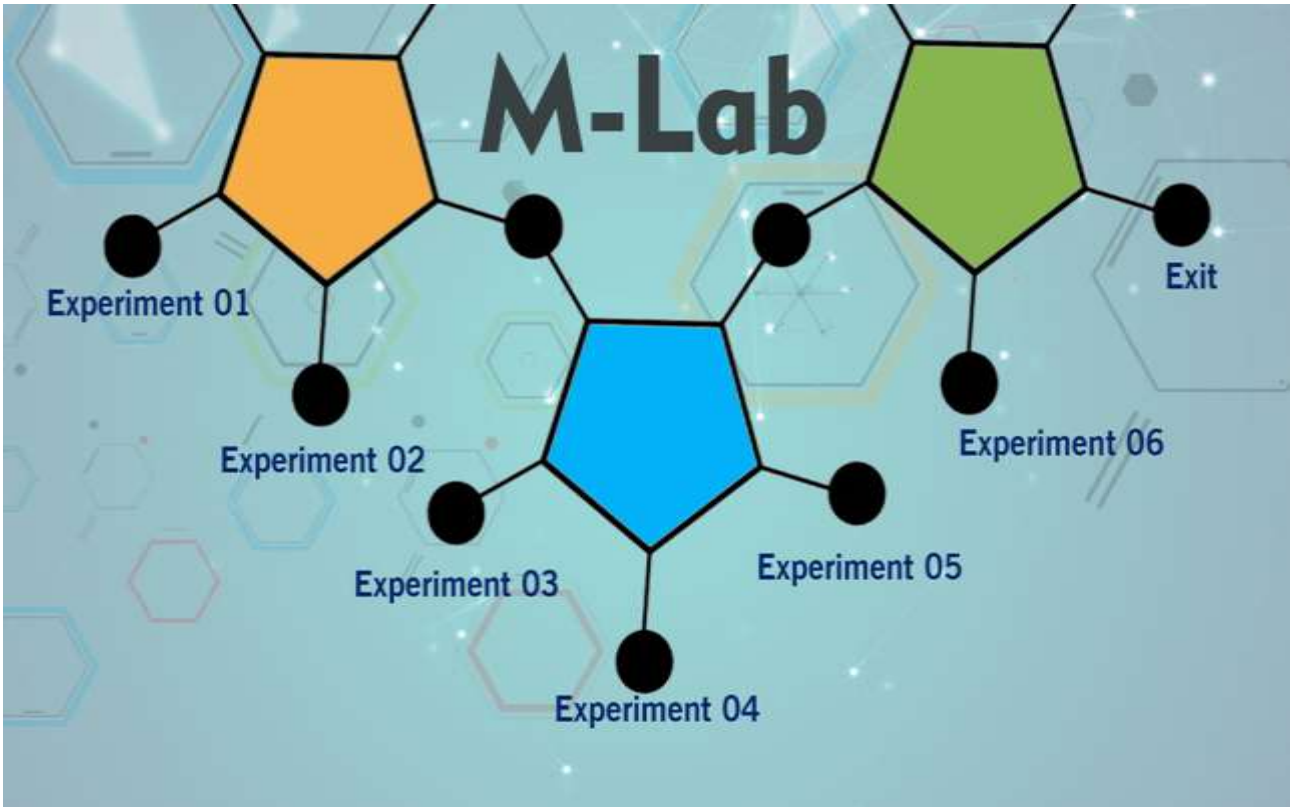


Fig 4: App opening screen screenshot

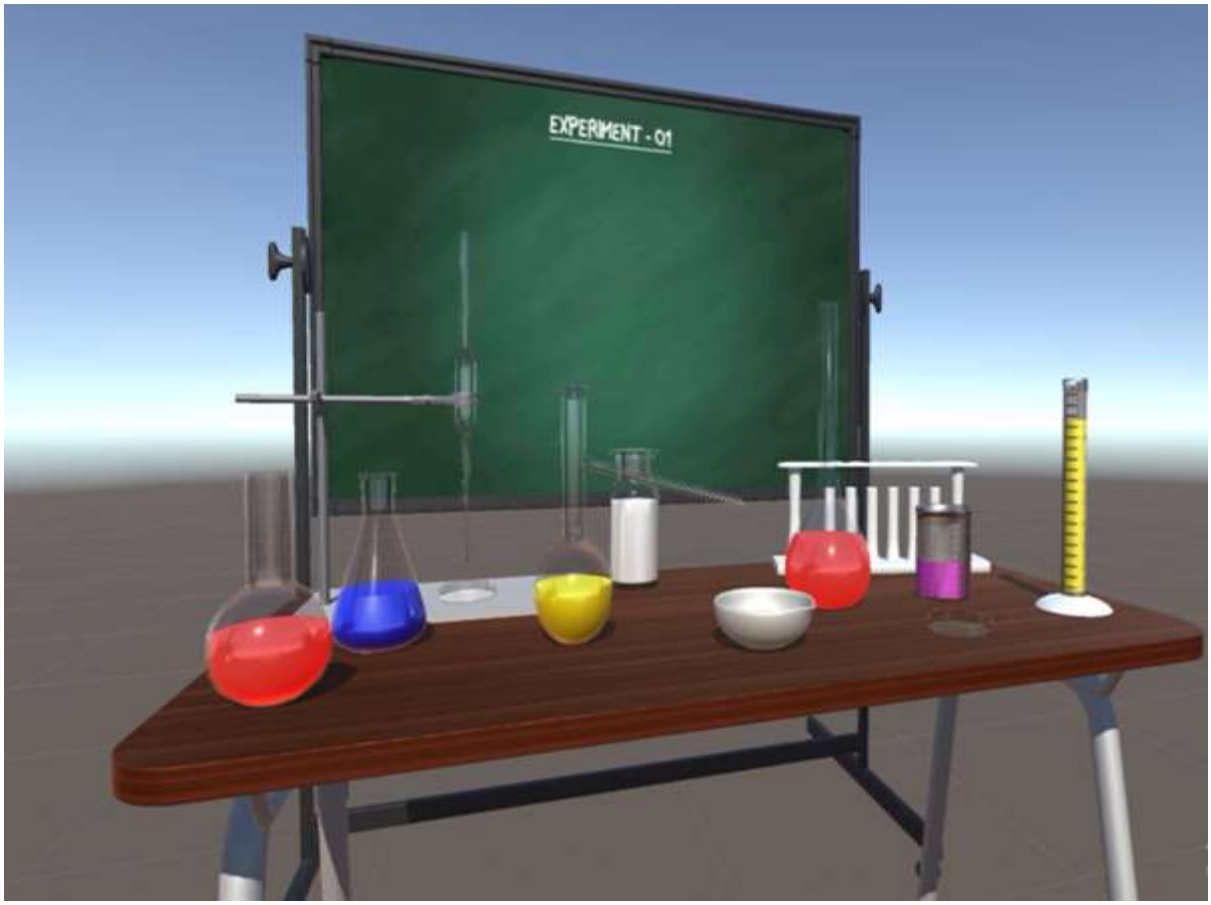
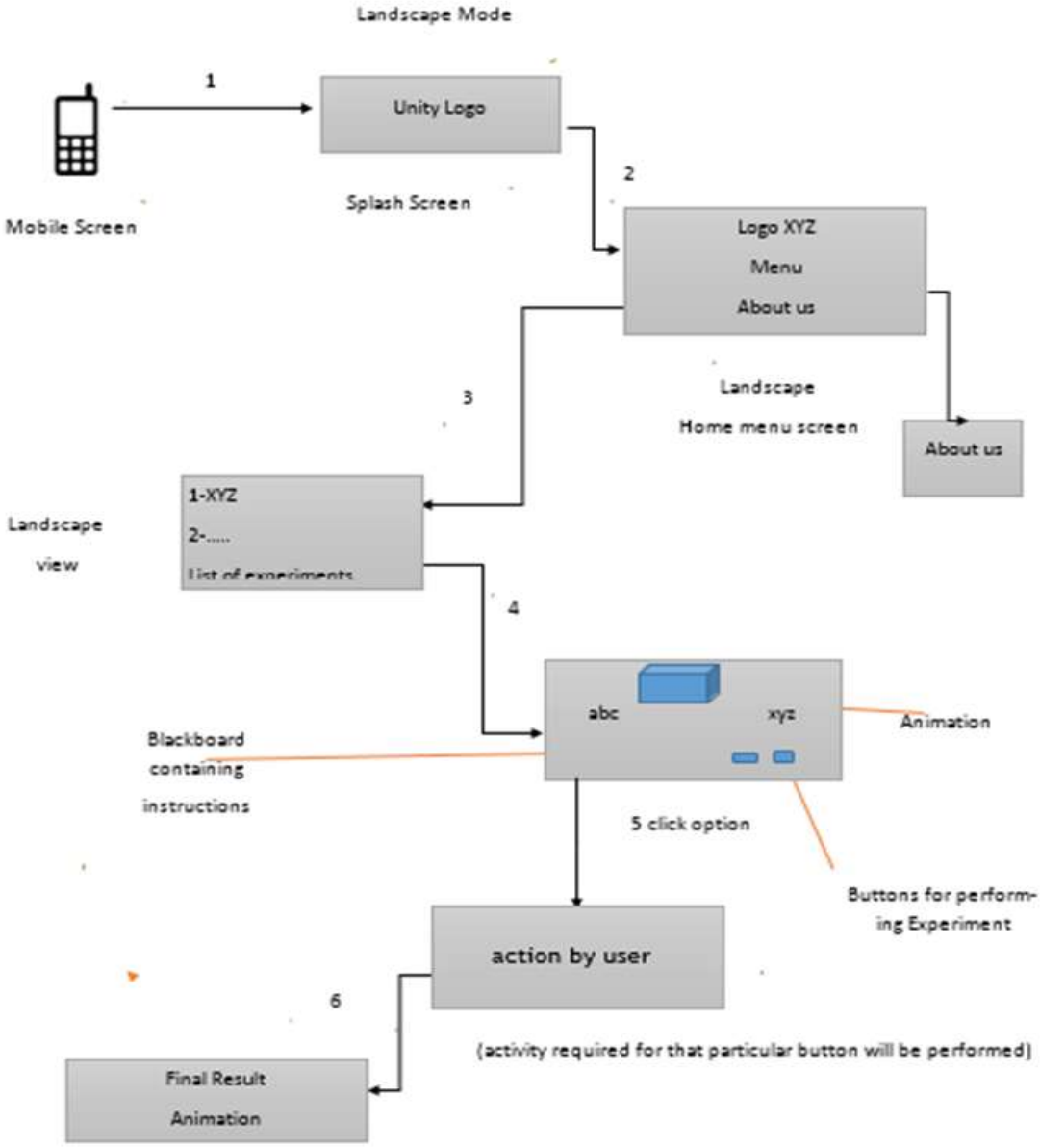


Fig 5: classroom screenshot from the app (below)

3. DESIGN

Data Flow Diagram



4. CONCLUSION

Augmented reality is considered a competence that has been around for years. Augmented reality is still in its initial phases; and thus the upcoming possible apps are endless. A lot of AR products have been presented in several kinds and spread around the world in education the apps of the domain of AR are very limited. In order to be feasible mainly to schools, this app revolves around giving the students an authentic scientific experience with all the aspects of simplicity and usability kept in mind.

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