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KONERU LAKSHMAIAH EDUCATIONAL FOUNDATION
(DEEMED TO BE UNIVERSITY)

DEPARTMENT OF COMPUTER SCIENCE ENGINEERING
(DST-FIST Sponsored Department)

CERTIFICATE

This is to certify that the Project Report entitled "Interactive Simulations Using Web Apps For Digital Education" is being submittedbyB.GuptamKumarRao(160030178),Y.BhargaviSaiPriyanka(160031542),KHarshitha(160030560) in partial fulfillment for the award of Bachelor of Technology in Computer Science Engineering during the academic year 2018-19.

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DECLARATION

We hereby declare that this project based lab report entitled **"**Interactive Simulations Using Web Apps For Digital Education**"**has been prepared by us in partial fulfillment of the requirement for the award of degree Bachelor of Technology in Computer Science Engineering during the academic year 2018-2019.We also declare that this project based lab report is of our own effort and it has not been submitted to any other university for the award of any degree.

Date:

Place: Vaddeswaram

<u>ACKNOWLEDGMENT</u>

ABSTRACT

Education System in India has gone through major technological changes in the past few years by introducing programs like Digital India, Make In India etc. Still, many rural areas haven't yet reached the technology. Even though, the technology or the computers are present, there is no proper usage due to lack of infrastructure or the inefficiency of staff. So, there are still many digital differences between the previleged and the under previleged students. In order to bridge this digital divide, a new change in the teaching methodologies needs to be introduced in to the system. There is a technological revolution happening right now and many smart and digital learning methodologies are being introduced into the current educational system. But, are they being used effectively. The primary objective of BalaSwecha is to bridge the growing digital divide in education between privileged and underprivileged in India. As a part of this movement, we are developing web applications to contribute to BalaSwecha Operating System.

LIST OF CONTENTS

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 School Education System

Education System in India has gone through major technological changes in the past few years by introducing programs like Digital India, Make In India etc. Still, many rural areas haven't yet reached the technology. Even though, the technology or the computers are present, there is no proper usage due to lack of infrastructure or the inefficiency of staff. So, there are still many digital differences between the previleged and the under previleged students. In order to bridge this digital divide, a new change in the teaching methodologies needs to be introduced in to the system. There is a technological revolution happening right now and many smart and digital learning methodologies are being introduced into the current educational system. But, are they being used effectively!

To address the above issue, some new way of learning methodology apart from this 'chalk' and 'talk' needs to be implemented to bridge the digital divide. Traditional learning involves class room teaching and the learner need to visualize the concept. This approach solely depends on the capability of the teacher. But, by using the new technical advancements, they can use the videos or some other means of learning to address the students. In this procedure, a new way of interactive learning needs to be introduced to attract the student to learn and make them closer to technology. Balaswecha is one such project where we design simulations for every concept so that learners can visualize the concept. It make them to experience the concept in a more realistic way.

1.2 Balaswecha

Now a days the prospectus of our essential understudies is very overwhelming. A little offspring of elementary school needs to peruse countless books were written in a manner that doesn't make enthusiasm for youthful personalities. This makes youngsters free viable learning and can't focus on their examinations . so as to keep up equalization in

education,there ought to be no absence of hypothetical practise.so present day instructive framework can't adapt to constant situations.A work should be possible when it semms to be simple . this happens just when it is justifiable. Inorder to make it un-derstandable functional methods ought to be executed. To present PC based learning at the school level for kids concentrating in government schools and different schools for the under-favored. Thrifty innova-tion, utilizing Open Hardware and Free Software innovations, will be the board on which PC supported learning will be conveyed. Specific equipment and delicate product (BalaSwecha) will be utilized for this reason.

These are a portion of the previously exising ventures in Balaswecha Repository that are as of now being developed stage. One can grow more to contribute for this balaswecha. To add to the current applications, you can discover the documentations joined as the Readme file to every vault which comprises of the rules to setup the advancement condition and run the application on your nearby machine. The goal isn't to build up the application increasingly confused. It ought to be planned in understudies point of view who is the end client. The exhibitions or reproductions should be straight forward and clear.

1.3 Free Software

1.3.1. Free Software definition

Free software is software that can be modified, freely used, and redistributed with only one restriction. Any redistributed version of the software must be distributed with the original terms of free use, modification, and distribution known as copyleft.

The definition of free software is stipulated as part of the GNU Project and by the Free software foundation. The "FREE" refers to the ability to reuse the software, modified or unmodified, as part of another software package. Users of free software may also have access to and study the source code so that they can modify the software for their requirments.

"Free software" defined as software that give freedom and community to the users.It says that the users have the freedom to run,

copy, distribute, study, change and improve the software.Free software is a mainly of liberty, and not about price.We call it "libresoftware," getting the name from French or Spanish word for free as in freedom, to show that the software is free and without any charge for the software.

The best example of free software is linux an operating system that is proposed as an alternative to windows or other proprietary operating systems. Debian is an example of a distributor of a Linux package.

1.3.2. Four essential freedoms

In free softwares there are four essential freedoms for the users to use them. In any condition, the above freedom will apply to all the users who are using the free softwares or and will apply to the others also. For example, consider a work A which leads to use work B to handle some of the cases to pass.If we start work A to give copies or distribute to others definetly the users need to use work B ,so to avoid these type of conflicts.we made the changes to the work A,so that there will be no use of work B for the users to use.

"Free software" may not be free at the time it may be for non-commerical also.Free software may be for commerical use,development & distribution.And developmnt of free software is no longer unusual and it may be usual for some time,these(free commerical) are very important.And already you may paid to get copies of required softwares for use,may be you get them for free.But they are always free to change them as required by the user.

1.4 Git- version control

Version control systems are a category of software tools that help a software team manage changes to source code over the time. Version control software keeps track of each and every modification to the code in a special kind of database. If a mistake is made, developers can turn back the clock and compare earlier versions of the code to help fix the mistake with out making distrubtance to all team members.

Version control enables groups to take care of these sorts of issues, following each individual change by every patron and keeping simultaneous work from clashing. Changes made in one a player in the product can be contrary with those made by another designer working in the meantime. This issue ought to be found and tackled in a systematic way without obstructing crafted by whatever is left of the group. Further, in all product improvement, any change can present new bugs alone and new programming can't be trusted until the point when it's tried. So testing and improvement continue together until the point when another version is prepared.

1.4.1 Gitlab

Gitlab is a web-based repository manager providing issue-tracking, wiki, and ci/cd pipeline features using open-source license, developed by gitlab inc. The code was intially written in ruby ,with some parts later written in go language, intially as a source code management solution to collaborate on software development. It later evolved to an integrated solution covering the software development life cycle, and the whole devops life cycle.

It follows an open core development model where the core fun ctionality is released under an open source license while additional functionality is under proprietary license.

1.5 NECESSITY OF DIGITAL EDUACTION

The down to earth means can make more intrigue instead of hypothetical one.there are numerous reasons that required viable information as it doesn't require robbing up, Knowledge holds in a single's psyche, Develops a superior Understanding, Includes practice, Improves aptitudes, Involves application and manages genuine circumstances and progressively over It is all the more fascinating. Viable information can frequently prompt a more profound comprehension of an idea through the demonstration of doing and individual experience. Finding out about actualities and speculations are

not by any means of any utilization except if you know about their application, in actuality, circumstance. So except if you are applying your hypothetical information to genuine circumstances through down to earth tests hypothesis doesn't hold much good and you will continue pondering that why you are concentrating that specific subject and while doing it for all intents and purposes, it tends to be in type of investigations, genuine activities or instructive excursions, the learning and the entire learning background remains in our psyche for long.

1.6 HOW IT HELPS

Essentially the movement balaswecha is directed for kids in government schools So as to influence them to learn in handy ways .it encourages the kids to learn in a superior manner .it makes more enthusiasm towards the idea and in this way influence youngsters to learn easier.As a part of this movement, we are developing web applications to contribute to BalaSwecha Operating System. We will then make the apps ready for deployment using task runners like Grunt / Gulp and then integrate the applications into Pencil Box in Bala Swecha.This makes children easier to learn the things. Digital training is one of the approaches to execute viable methods. Presently,we have done on three concepts. Every week students of our open source community go to schools and help children learn things by practical ways.So this application helps for kids who learn in hypothetical approaches to learn in an advanced way .along these lines it connects between present day instruction and computerized training.

CHAPTER 2
LITERATURE SURVEY

The main theme is to bridge the growing digital divide in education between privileged and underprivileged in India. As a part of this movement, we are developing web applications to contribute to an Operating System which we named it as Balaswecha. We implemented this idea as an activity in our nearby government schools. The idea is to make learn the concepts of their syllabus By showing them visual presentation . taking this as the source we thought of contributing by developing apps such as e-litmus,watercycle,xplore atmosphere.E-litmus is about properties and characteristics of some acids and bases.when a litmus paper is dipped in the solution ,the color change shows whether it is an acid or base,their respective ph value and some information about that solution . visual presentation can be possible with this app.In watercycle app,the process of water cycle such as evaporation ,condensation which means formation of clouds are shown .In xplore atmosphere ,we designed in such a way that rocket explores in different layers of atmosphere and some details of that particular layer is displayed .the data collection we have done for each app is mentioned below

2.1Watercycle:-

The change of water from fluid to gas stages as it moves starting from the earliest stage waterways into the overlying atmosphere.The wellspring of vitality for dissipation is essentially sunlight based radiation. Dissipation frequently certainly incorporates transpiration from plants, however together they are explicitly alluded to as evapotranspiration. Absolute yearly evapotranspiration adds up to roughly 505,000 km3 (121,000 cu mi) of water, 434,000 km3 (104,000 cu mi) of which vanishes from the oceans. 86% of worldwide dissipation happens over the ocean.

2.1.1 Sublimation:-
The state change straightforwardly from strong water (snow or ice) to water vapor by passing the fluid state.
2.1.2 Deposition:-
This alludes to changing of water vapor straightforwardly to ice.
Shift in weather conditions. The development of water through the

atmosphere.Without shift in weather conditions, water that vanished over the seas couldn't encourage over land.

2.1.3 Condensation:-

The arrival of water vapor from plants and soil into the air

2.1.4 Transpiration:-

Water streams vertically through the dirt and shakes affected by gravity.

2.1.5 Plate tectonics:-

Water enters the mantle by means of subduction of maritime outside layer. Water comes back to the surface through volcanism.

The water cycle includes a considerable lot of these procedures.

Figure-2.1.1 Process of Water-cycle
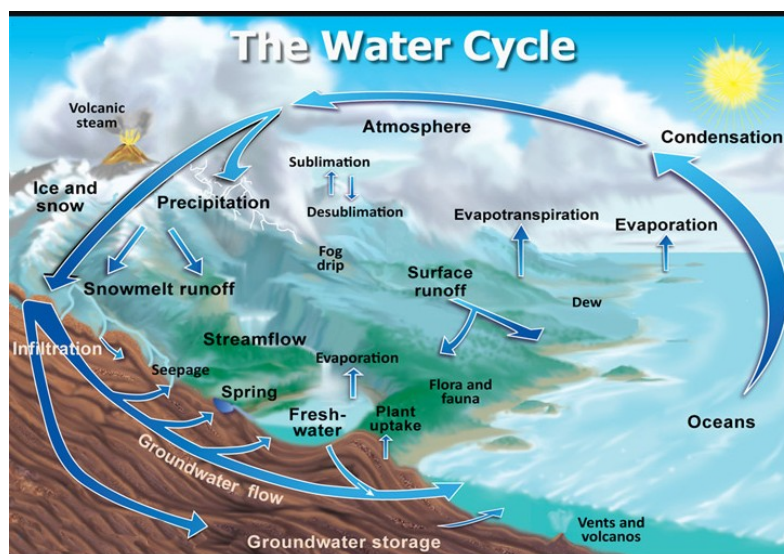
2.2.1Xplore atmosphere:-

2.2.1 Troposphere:

The lowest layer extending 6-10 km from earth surface.The troposphere is the first layer above the surface and contains half of the Earth's atmosphere.weather occurs in this layer

2.2.2 Stratosphere:

A second major atmospheric layer upwards from troposphere to 50km above the earth surface. Many jet aircrafts fly in the stratosphere because it is very stable.

2.2.3 Mesosphere:

Between Stratosphere and Thermosphere, 50-80 km in altitude. Meteors or rock

fragments burn up in the mesosphere

2.2.4 Thermosphere:

Above 80km where temperature increase continuously. The thermosphere is a layer with auroras. It is also where the space shuttle orbits.

2.2.5 Exosphere:

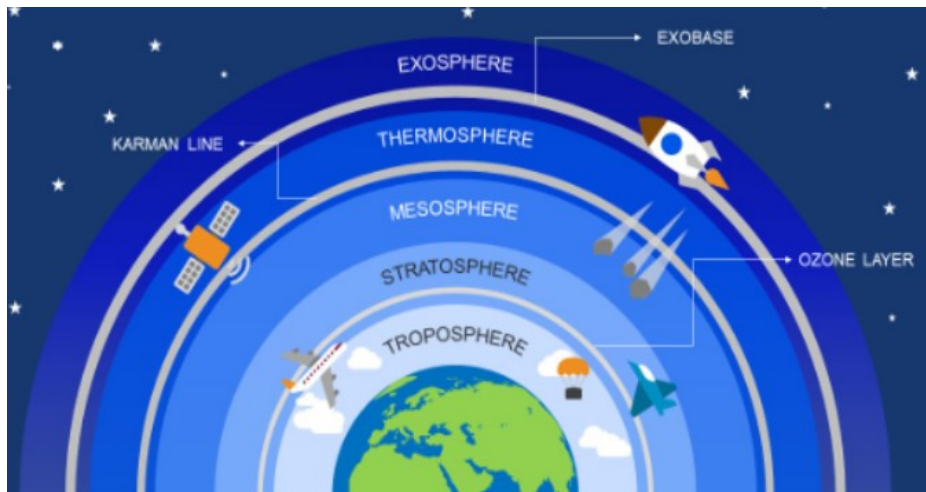 The outer most atmospheric region of earth with most dense air. The atmosphere merges into space in the extremely thin exosphere. This is the upper limit of our

atmosphere.

Figure-2.3.1 Layers of Atmosphere

CHAPTER 3
WATER CYCLE

3.1 Concept

3.1.1 Evaporation:-

It is the procedure by which water changes over from fluid to vapor structure. The change to vapor guarantees water is exchanged from land and water bodies into the air. At the point when water is warmed, it dissipates after the atoms move and vibrate so rapidly, they escape into the environment as water vapor particles. Dissipation is one of two types of vaporization, the other being bubbling. For dissipation to happen, vitality is required as it continues quicker at higher temperature, and higher stream rates between the vaporous and fluid stage, and, in fluids, in instances of lower surface strain on water. Surface pressure is the flexible propensity of a liquid that enables creepy crawlies to glide on water and have strain that considers bubbles development.

In spite of the fact that water levels in water bodies seem to diminish because of the sun's warmth, the got away atoms don't vanish. They remain in the climate, and influence moistness and impact the dampness sums noticeable all around. Districts with high temperatures and vast water bodies are sticky because of water vanishing and staying noticeable all around as vapor. Dissipation additionally helps in cloud arrangement. A while later the mists discharge the dampness as precipitation. In plants, transpiration is water dissipation from plants. In transpiration, water or minerals are conveyed from the roots, to the underside pores on the leaves in a plant. From these pores water vanishes into the climate and that helps keep a plant cool, amid sweltering climates.

3.1.2 Condensation:-

The water vapor that has ascended into the sky cools essentially when it comes into contact with the cooler air found up high. The vapor turns into a cloud, which is pushed far and wide by moving air flows and winds. If the water vapor cools to anything over zero degrees centigrade, it will gather as water. Basically, the water vapor will begin to consolidate on the outside of small particles of residue and earth that ascended with the vapor amid the procedure of vanishing. These minor beads will begin to fall into each other and union, delivering a bigger bead. At the point when a

bead is sufficiently vast, gravity will pull it down at a rate that surpasses the updraft in the cloud, prompting the bead dropping out of the cloud and onto the ground beneath. This procedure is called 'precipitation', or – all the more generally – precipitation.

If precipitation happens in conditions which are especially cold or have low pneumatic force, at that point these water beads can frequently take shape and stop. This makes the water fall as strong ice, known as hail, or as snow. On the off chance that the conditions are in the middle of those related with snow and downpour, the beads will fall as frosty cool, half solidified water usually alluded to as hail.

3.1.3 Precipitation:

The water that has fallen as downpour is ingested into the ground through a procedure known as 'invasion'. Soil and different permeable materials can assimilate incredible arrangements of water along these lines, while rocks and other harder substances will just hold a little measure of water. At the point when the water invades soil, it will move every which way until it either saturates adjacent streams or else sink further into what is known as 'groundwater capacity'. This is the place the water that does not leak out or vanish signs up under the ground, immersing the littlest niches and crevices of shake and soil under the ground. These arrangements are otherwise called 'aquifers', and clarify why some of the time the ground underneath the top soil is soggy or soaked. When an aquifer turns out to be excessively full, it begins to spill out onto the surface framing what is referred to generally as a 'spring'. These can regularly be found in developments of permeable or weak shake, which can split after marginally acidic precipitation. Should the water be situated close to a well of lava or any wellspring of common warm vitality, it will shape a hot spring.

3.1.4 Runoff:

After the water has fallen and the dirt has turned out to be immersed, or the snow has softened, the water pursues gravity and tumbles down any slopes, mountains, or different grades to frame or join waterways. This procedure is known as 'overflow', and it is the manner by which water stops in lakes and comes back to the sea. The water falls as per the slope of the spot from which it is falling, and when a few strings of water meet they structure a stream. The course in which the water moves is known as 'streamflow', and it is fundamental to the idea of the ebbs and flows inside waterways and streams. These streams and waterways will keep running off in the long run to either frame lakes or rejoin the sea, contingent upon their vicinity to the sea. Because of the measure of water put away in snow or ice, unexpected

increment in the warmth can prompt flooding because of the water abruptly softening and running off at a disturbing rate. This is the reason flooding can happen so effectively amid a warm spring following an especially cold and gnawing winter.

When more snow falls than dissipates or sublimates, the ice will minimizedthickly to frame what are known as 'ice tops'. The ice tops and icy masses situated in the coldest districts of the world are the greatest accumulations of ice on the planet, and are gradually beginning to contract as the water in which they sit is getting to be hotter. This occurs in a recurrent way, with no start or end. As precipitation occurs in one piece of the world evapotranspiration is going on elsewhere. The cycle of water never closes, which is the reason the seas remain level, there are dependably mists some place in the sky, and drinkable water doesn't abruptly simply run out. Sooner or later, any water that has penetrated will be discharged, any that has joined the sea will dissipate, and even a vast bit of the ice tops may dissolve, discharging water that has been put away for many years once again into the water cycle with conceivably destructive impacts.

3.2 Usage

The whole concept mentioned above is designed as a simulation. The components expected are sun,birds,hills,clouds water bodies ,description on what information should be provided about the results etc. This simulation could be added to the science subject in Balaswecha Operating System and is deployed in schools. Students will be able to simulate this process even in the absence of laboratories or equipment in the campus infrastructure. This helps the students to understand the concepts easier and faster. This reduces the digital divide between the facilitated and the non-facilitated students which inturn helps us to maintain the decentralization in the current education system.

3.3 Tech Stack Used
- Node JS
- React JS
- React Router
- JSX (Java Script XML)
- CSS

3.3.1 Node JS

Node JS is used as the development environment to develop Water Cycle App. Node.js is a JavaScript runtime based on Chrome's V8 JavaScript motor. Node.js utilizes an event driven, non-blocking I/O model that makes it lightweight and productive. We will use Node/ Express in the backend and React in frontend.Npm is a package manager through which one can install various packages (modules) needed for web development. It's a CLI tool which gives access to it's online repository which contains thousands of open-source Node.js projects.

3.3.2 React JS

React is a front-end Java Script library used to build reusable components. The main reason to integrate react in our project is its component reusability feature. The end goal is to build a component library for Balaswecha apps. Which helps the new developers to design the concepts easy and fast. We have used many additional libraries for React in this project for the purpose of animations. To make the project a single page application, we make use of React-router which is not available in the React JS library.

We have installed many peer dependencies for our react application. Some of them are:

"react": "^16.8.2",

"react-dom": "^16.8.2",

"react-grid-system": "^4.4.2",

"react-marquee": "^1.0.0",

"react-rain-animation": "^1.0.4",

"react-scripts": "^2.1.8",

"react-spring": "^8.0.9",

"semantic-ui-react": "^0.85.0"

The above used dependencies are installed using npm and they are saved in the node_modules folder. These are used to animate the components.

3.3.3 Project File Hierarchy

Respond doesn't have conclusions on how you placed documents into envelopes. That said there are a couple of basic methodologies prevalent in the environment you may need to consider.There are many torment focuses related with profound registry settling in JavaScript ventures. It ends up more diligently to compose relative imports between them, or to refresh those imports when the

documents are moved. Except if you have an extremely convincing motivation to utilize a profound envelope 4structure, consider restricting yourself to a limit of three or four settled organizers inside a solitary venture. Obviously, this is just a suggestion, and it may not be pertinent to your task. In the event that you feel totally stuck, begin by keeping all documents in a solitary organizer. In the end it will develop sufficiently vast that you will need to isolate a few records from the rest. At that point you'll have enough information to tell which records you alter together frequently. When all is said in done, it is a smart thought to keep records that regularly change together near one another. This guideline is designated "colocation". In the water cycle, when using React App, below files are created. Lets understand whats going on in these files.
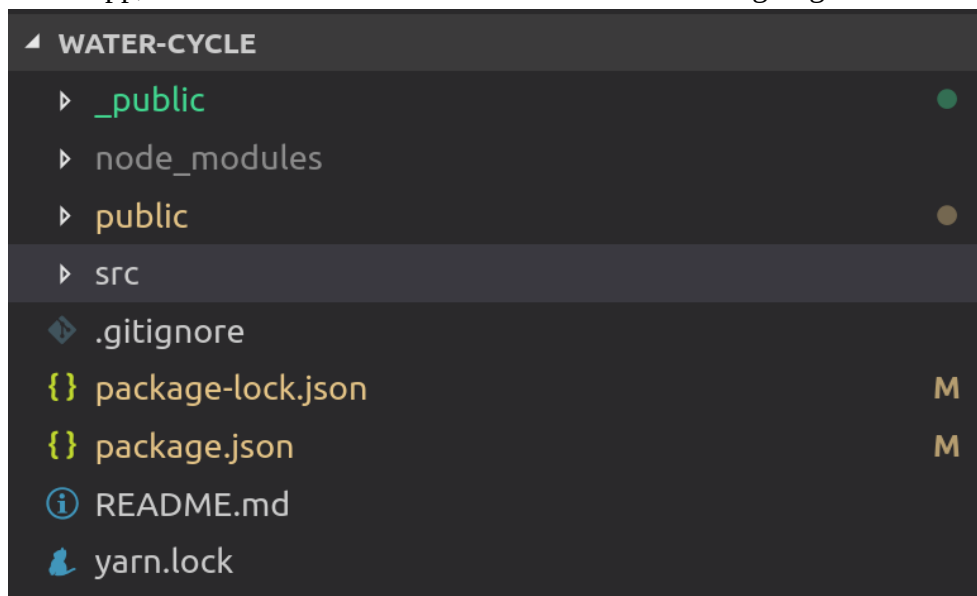

Figure- 3.3.3.1 Image of File Hierarchy

The above figure contain the file hierarchy of our react app. Here, all the files used in the project are in one of these folders. Src folder consists of the codebase.
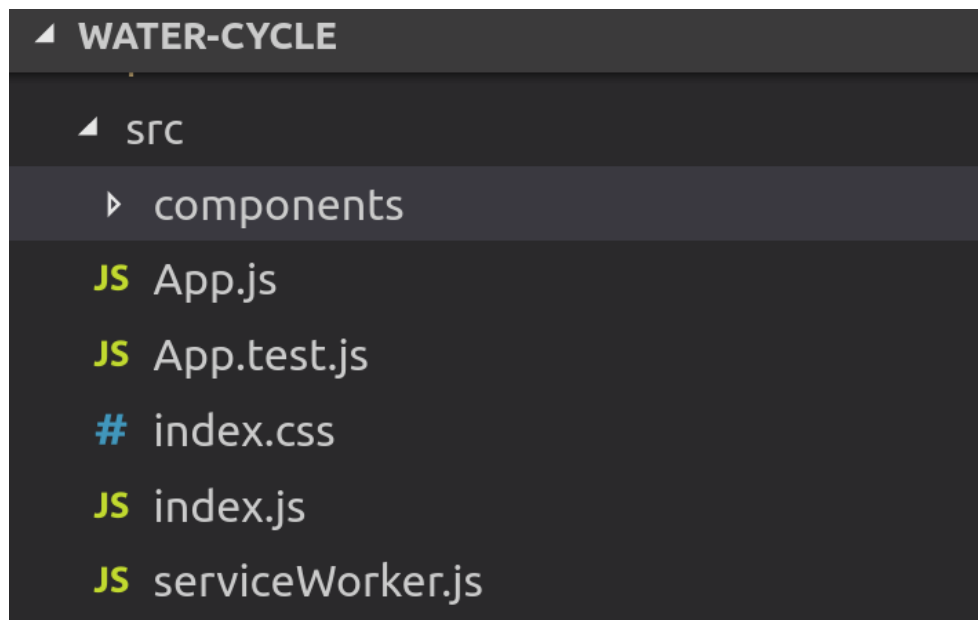
.

Figure-3.3.3.2 Image of Root Code

Index.js file consists of the root code to start the app which is auto generated by CREATE-REACT-APP package installed to create react apps. The app.js file is the main component of the react app. In this, all the sub components will be managed.

3.3.4 React- Router

This bundle gives the core routing functionality to React Router, however you might not have any desire to introduce it straightforwardly. On the off chance that you are composing an application that will keep running in the program, you ought to rather introduce respond switch dom. So also, in the event that you are composing a React Native application, you ought to rather introduce respond switch local. Both of those will introduce respond switch as a dependancy.

A single-page application (SPA) is a web application or site that connects with the client by progressively modifying the present page as opposed to stacking whole new pages from a server. This methodology keeps away from interference of the client experience between progressive pages, influencing the application to carry on increasingly like a work area application. In a SPA, either all fundamental code – HTML, JavaScript, and CSS – is recovered with a solitary page load or the proper assets are progressively stacked and added to the page as essential, ordinarily in light of client activities.

Figure-3.3.3.3 Image of Solitary Page Load

The page does not reload anytime all the while, nor controls exchange to another page, despite the fact that the area hash or the HTML5 History API can be utilized to give the observation and traversability of independent legitimate pages in the application.Interaction with the single page application frequently includes dynamic communication with the web server in the background. The biggest difference is that navigating a single-page app doesn't involve going to an entirely new page. Instead, your pages (commonly known as views in this context) typically load inline within the same page itself. With multi-page apps, these three things come for free. There is nothing extra you have to do for any of it.

With single-page apps, because you aren't navigating to an entirely new page, you have to do real work to deal with these three things that your users expect to just work. You need to ensure that navigating within your app adjusts the URL appropriately. You need to ensure your browser's history is properly synchronized with each navigation to allow users to use the back and forward buttons. If users bookmark a particular view or copy/paste a URL to access later, you need to ensure that your single-page app takes the user to the correct place. To deal with all of this, you have a bucket full of techniques commonly known as routing. Routing is where you try to map URLs to destinations that aren't physical pages such as the individual views in

your single-page app. That sounds complicated, but fortunately there are a bunch of JavaScript libraries that help us out with this. One such JavaScript library is the star of this tutorial, React Router provides routing capabilities to single-page apps built in React, and what makes it nice is that extends what you already know about React in familiar ways to give you all of this routing awesomeness.

3.3.5 JSX

This funny tag below is neither a string nor HTML. It is called JSX, and it is a syntax extension to JavaScript. We recommend using it with React to describe what the UI should look like. JSX may remind you of a template language, but it comes with the full power of JavaScript. React doesn't require using JSX, but most people find it helpful as a visual aid when working with UI inside the JavaScript code. It also allows React to show more useful error and warning messages.

const element = <h1>Hello, world!</h1>;

One of the greatest thing we've overlooked is endeavoring to make sense of what occurs with our JSX after we've composed it. How can it end up as HTML that we find in our program? How does it actually work? Why do we not just call it HTML? What quirks does it have up its sleeve? The thing to keep in mind is that our browsers have no idea what to do with JSX. They probably think you are crazy if you ever even try to describe JSX to them. That is why we have been relying on things like Babel to turn that JSX into something the browsers understand JavaScript. What this means is that the JSX we write is for human (and well-trained cats) eyes only. When this JSX reaches our browser, it ends up getting turned into pure JavaScript. As we've been working with JSX, you probably noticed that we ran into some arbitrary rules and exceptions on what you can and can't do. In this section, let's put many of those quirks together in one area and maybe even run into some brand new ones.

3.4 Implementation

The whole process of implementing the app starts with designing. We need to replicate the actual concept with simulation. So, once the design is fixed, the main task is to develop the project layout. In this case, we should design analyse all the required components used in the water cycle concept. So, the next step is to convert the physical attributes and elements into desingnable components. Here, we have 4 stages, i.e

- Evaporation

- Condensation
- Precipitation and
- Collection

In each stage, we require differnt components like sun, coluds, rain, birds etc. Some of them are reusable components. So, the components should be designed to maintain the reusability. Moreover, we need to use the project management tools extensively. That enables the ease of development and the stability of our code. In that case, we use kanban boards to plan and develop the components in gitlab. Dividing the works among the team and managing them is well maintained by using these tools. We need to make our apps as SPA's i.e Single Page Applications where the whole page doesn't get reloaded when we navigate through our stages in the app.

To perform Single Page Application, React JS doesn't have any built in functionality whereas Angular is packed with it in its framework itself. So, to enable its support to single page application, we need to install React-Router-Dom. Router may seem to be a bit complex word but this package makes it very easy to develop nested structures to navigate through the views only reload that are intended to change. We use Switch, Router, Redirect from React-Router in the Main Component to define the navigation or the url to navigate when a component is requested by an event. We enclose the controls in Link for normal links or buttons and NavLink for NavBar comonents. When the button enclosed in Link tag is triggered through DOM, the Router in the main component open the requested url by the Link and reloads the component specified by the Router. In case of invalid URL or Link, the default component is reloaded using the Redirect method from React-Router.

We need state management to control what components to appear in specific layer or stage. States are generally declared in constructor. These are accessed by using 'this' keyword. We use states to manipulate all the components. For example, we need to hide sun component while rain is enabled by the phase change. Here, we can just use state management to alter the state of the sun by validating the component using this.state.sun key. Similarly, we can use this state transition to manage all the components in the app.

The main part to design the simulations is to add animations. Generally, animations add life to the web apps and they make the simulations active.

3.5 Outputs & User Manual

Follow the documentation in the ReadMe.txt file in the project. Install the required tools required to run the project. The apps are deployed in gitlab using the Continuous Integration and Continuous Deployment (CI/CD) feature in gitlab. For example, the Water Cycle app is currently deployed in the server.
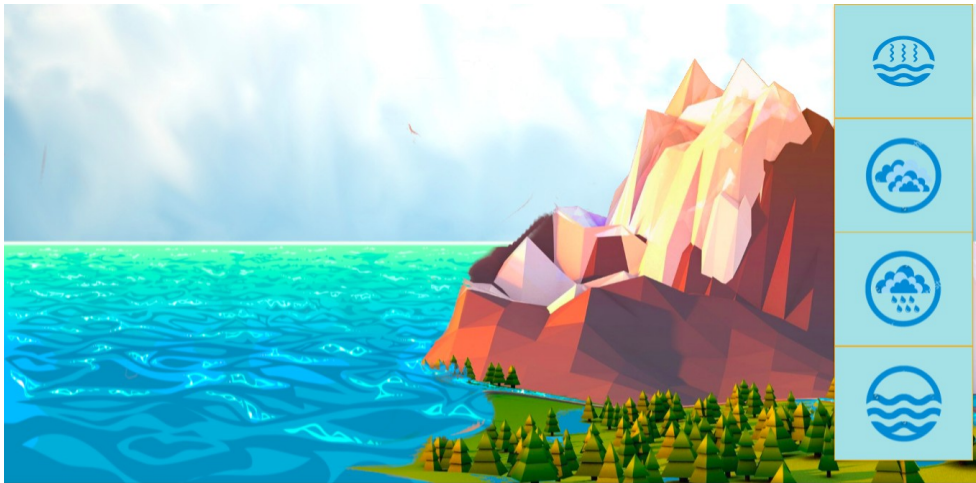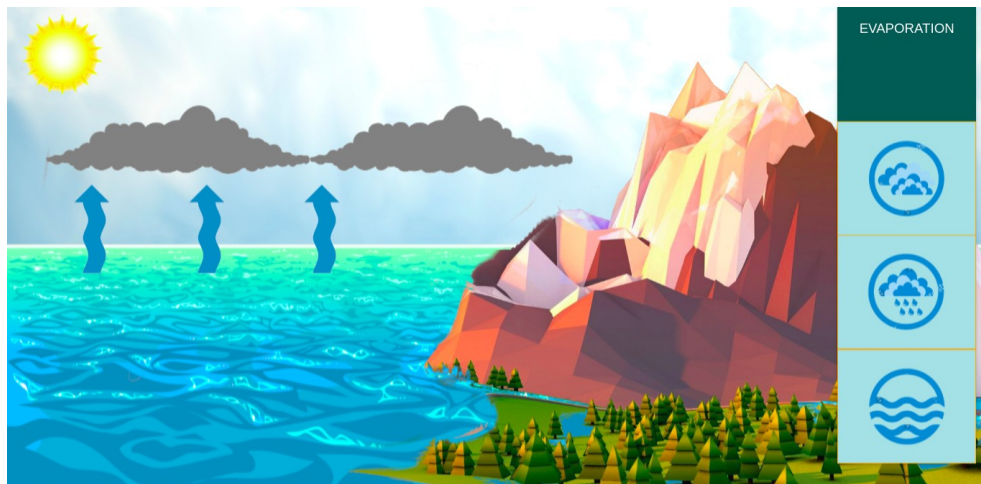
http://kluglug.swecha.io/water-cycle

Figure 3.5.1:-water cycle app

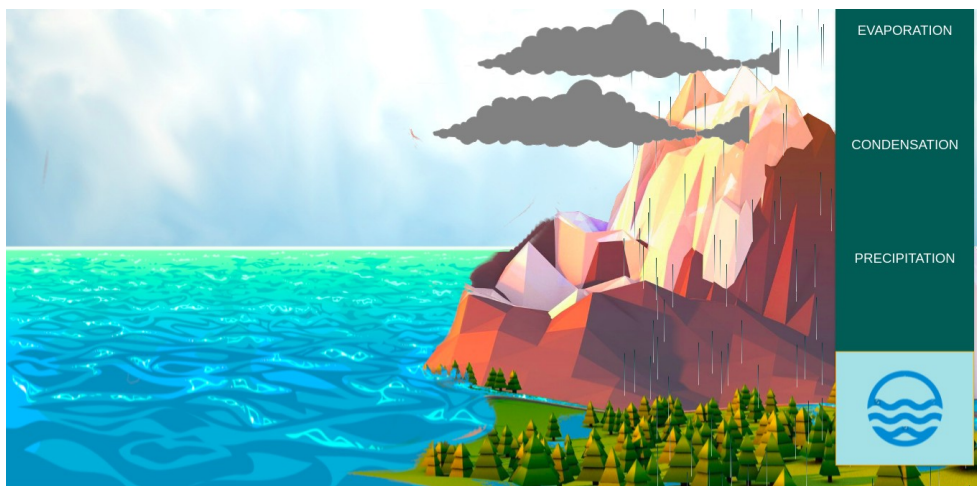**Figure 3.5.2:-Evaporation Phase**

Figure 3.5.3:-Pecipitation Phase

Figure 5.5.4:-Run off Phase

CHAPTER 4
XPLORE ATMOSPHERE

4.1 Concept

Xplore Atmosphere is all about exploring the layers in our atmosphere by using this simulation. Learners can visually experience the change occuring in each layer of the atmosphere.

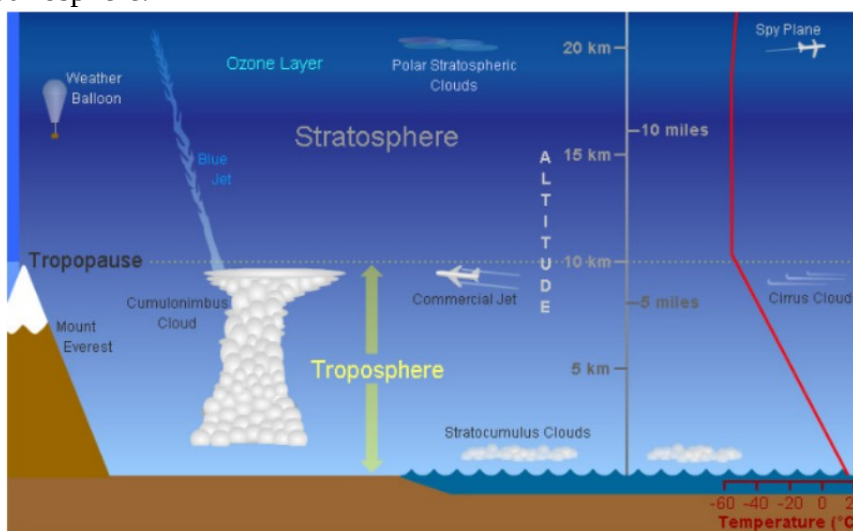**Figure 4.1.1:-Troposphere**

The troposphere is the most reduced layer of Earth's environment. A large portion of the mass (around 75-80%) of the air is in the troposphere. Most sorts of mists are found in the troposphere, and practically all climate happens inside this layer. The troposphere is by a wide margin the wettest layer of the air; the majority of the layers above contain next to no dampness.
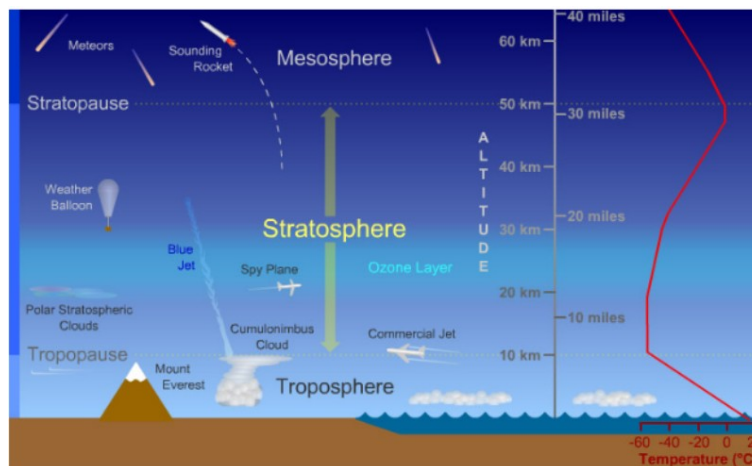
Figure 4.1.2:-Stratosphere

The stratosphere is a layer of Earth's climate. It is the second layer of the air as you go upward. The troposphere, the most reduced layer, is directly underneath the stratosphere. The following higher layer over the stratosphere is the mesosphere. The base of the stratosphere is around 10 km (6.2 miles or around 33,000 feet) over the ground at center scopes. The highest point of the stratosphere happens at an elevation of 50 km (31 miles). The stature of the base of the stratosphere differs with scope and with the seasons. The lower limit of the stratosphere can be as high as 20 km (12 miles or 65,000 feet) close to the equator and as low as 7 km (4 miles or 23,000 feet) at the shafts in winter. The lower limit of the stratosphere is known as the tropopause.
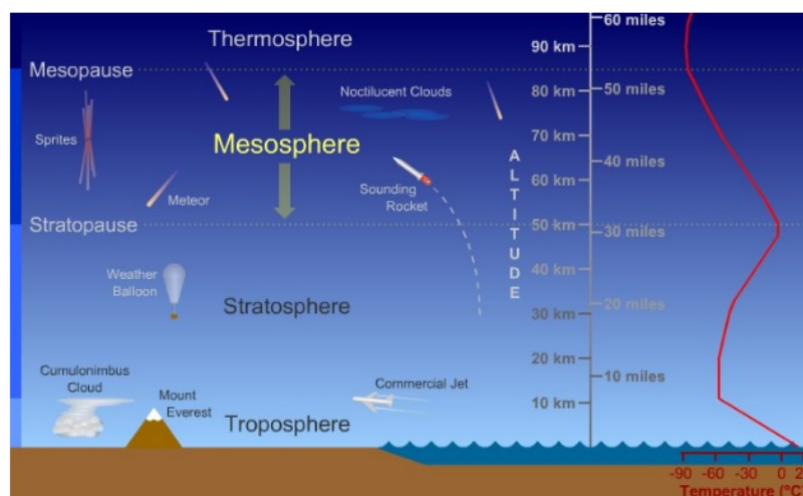

Figure 4.1.3:-Mesosphere

The mesosphere is a layer of Earth's air. The mesosphere is legitimately over the stratosphere and underneath the thermosphere. It stretches out from around 50 to 85

km (31 to 53 miles) over our planet. Temperature diminishes with tallness all through the mesosphere. The coldest temperatures in Earth's air, about - 90° C (- 130° F), are found close to the highest point of this layer. The limit between the mesosphere and the thermosphere above it is known as the mesopause. At the base of the mesosphere is the stratopause, the limit between the mesosphere and the stratosphere beneath.

The mesosphere is hard to examine, so less is thought about this layer of the climate than different layers. Climate inflatables and other flying machine can't fly sufficiently high to achieve the mesosphere. Satellites circle over the mesosphere and can't straightforwardly gauge attributes of this layer. Researchers use instruments on sounding rockets to test the mesosphere straightforwardly, however such flights are brief and rare. Since it is hard to take estimations of the mesosphere straightforwardly utilizing instruments, much about the mesosphere is as yet strange.
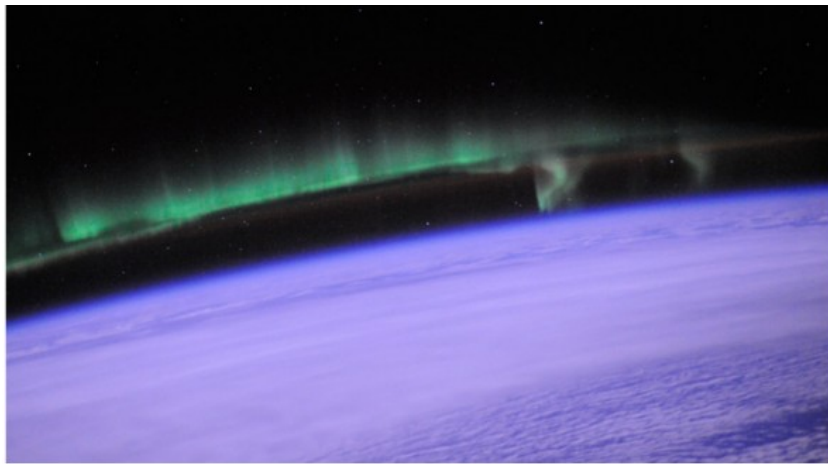
Figure 4.1.4:-Thermosphere

The thermosphere is a layer of Earth's air. The thermosphere is legitimately over the mesosphere and underneath the exosphere. It reaches out from around 90 km (56 miles) to somewhere in the range of 500 and 1,000 km (311 to 621 miles) over our planet. Temperatures climb pointedly in the lower thermosphere (underneath 200 to 300 km elevation), at that point level off and hold genuinely relentless with expanding height over that stature. Sunlight based action firmly impacts temperature in the thermosphere. The thermosphere is regularly about 200° C (360° F) more sizzling in the daytime than during the evening, and generally 500° C (900° F) more smoking when the Sun is exceptionally dynamic than at different occasions. Temperatures in

the upper thermosphere can go from about 500° C (932° F) to 2,000° C (3,632° F) or higher.

The limit between the thermosphere and the exosphere above it is known as the thermopause. At the base of the thermosphere is the mesopause, the limit between the thermosphere and the mesosphere beneath. Despite the fact that the thermosphere is viewed as a major aspect of Earth's climate, the air thickness is so low in this layer the greater part of the thermosphere is the thing that we typically consider as space. Indeed, the most well-known definition says that space starts at an elevation of 100 km (62 miles), somewhat over the mesopause at the base of the thermosphere. The space transport and the International Space Station both circle Earth inside the thermosphere. Beneath the thermosphere, gases made of various sorts of particles and atoms are completely combined by disturbance in the environment. Air in the lower climate is for the most part made out of the well-known mix of about 80% nitrogen atoms (N2) and about 20% oxygen particles (O2). In the thermosphere or more, gas particles impact so inconsistently that the gases become to some degree isolated dependent on the sorts of synthetic components they contain. Fiery bright and X-beam photons from the Sun additionally break separated atoms in the thermosphere. In the upper thermosphere, nuclear oxygen (O), nuclear nitrogen (N), and helium (He) are the primary parts of air.

Figure 4.1.5:-Exosphere

The exosphere is the highest locale of Earth's environment as it continuously

blurs into the vacuum of room. Air in the exosphere is amazingly meager - from multiple points of view it is nearly equivalent to the airless drained of space. The layer straightforwardly beneath the exosphere is the thermosphere; the limit between the two is known as the thermopause. The base of the exosphere is in some cases additionally alluded to as the exobase. The elevation of the lower limit of the exosphere shifts. At the point when the Sun is dynamic around the pinnacle of the sunspot cycle, X-beams and bright radiation from the Sun warmth and "puff up" the thermosphere - raising the elevation of the thermopause to statures around 1,000 km (620 miles) over Earth's surface. At the point when the Sun is less dynamic amid the depressed spot of the sunspot cycle, sun powered radiation is less extreme and the thermopause subsides to inside around 500 km (310 miles) of Earth's surface.

In spite of the fact that the exosphere is in fact part of Earth's air, from multiple points of view it is a piece of space. Numerous satellites, including the International Space Station (ISS), circle inside the exosphere or underneath. For instance, the normal elevation of the ISS is around 330 km (205 miles), setting it in the thermosphere beneath the exosphere! In spite of the fact that the environment is, slim in the thermosphere and exosphere, there is still enough air to cause a slight measure of drag compel on satellites that circle inside these layers. This drag drive bit by bit moderates the shuttle in their circles, with the goal that they in the long run would drop out of circle and wreck as they returned the climate except if something is done to help them back upwards. The ISS loses around 2 km (1.2 miles) in height every month to such "orbital rot", and should intermittently be given an upward lift by rocket motors to keep it in circle.

4.2 Usage

The whole concept mentioned above is designed as a simulation. The components expected are ozone layer, satellite ,space craft, aurora, rocket ,space shuttle ,meteros , parachutes, clouds ,air crafts ,mount everest etc .description on what information should be provided about the results etc. This simulation could be added to the social subject in Balaswecha Operating System and is deployed in schools. Students will be able to simulate this process even in the absence of laboratories or equipment in the campus infrastructure. This helps the students to understand the concepts easier and faster. This reduces the digital divide between the facilitated and

the non-facilitated students which inturn helps us to maintain the decentralization in the current education system.

4.3 Tech Stack Used

- Node JS
- React JS
- React Router
- JSX (Java Script XML)
- CSS

4.3.1 Node JS

Node JS is used as the development environment to develop atmosphere App. Node.js is a JavaScript runtime based on Chrome's V8 JavaScript motor. Node.js utilizes an event driven, non-blocking I/O model that makes it lightweight and productive. We will use Node/ Express in the backend and React in frontend.Npm is a package manager through which one can install various packages (modules) needed for web development. It's a CLI tool which gives access to it's online repository which contains thousands of open-source Node.js projects.

4.3.2 React JS

React is a front-end Java Script library used to build reusable components. The main reason to integrate react in our project is its component reusability feature. The end goal is to build a component library for Balaswecha apps. Which helps the new developers to design the concepts easy and fast. We have used many additional libraries for React in this project for the purpose of animations. To make the project a single page application, we make use of React-router which is not available in the React JS library.

We have installed many peer dependencies for our react application. Some of them are:

```
"react": "^16.8.2",
"react-dom": "^16.8.2",
"react-grid-system": "^4.4.2",
"react-marquee": "^1.0.0",
"react-rain-animation": "^1.0.4",
```

```
"react-scripts": "^2.1.8",
"react-spring": "^8.0.9",
"semantic-ui-react": "^0.85.0"
```

The above used dependencies are installed using npm and they are saved in the node_modules folder. These are used to animate the components.

4.3.3 Project File Hierarchy

React doesn't have conclusions on how you placed documents into envelopes. That said there are a couple of basic methodologies prevalent in the environment you may need to consider.There are many torment focuses related with profound registry settling in JavaScript ventures. It ends up more diligently to compose relative imports between them, or to refresh those imports when the documents are moved. Except if you have an extremely convincing motivation to utilize a profound envelope structure, consider restricting yourself to a limit of three or four settled organizers inside a solitary venture. Obviously, this is just a suggestion, and it may not be pertinent to your task. In the event that you feel totally stuck, begin by keeping all documents in a solitary organizer. In the end it will develop sufficiently vast that you will need to isolate a few records from the rest. At that point you'll have enough information to tell which records you alter together frequently. When all is said in done, it is a smart thought to keep records that regularly change together near one another. This guideline is designated "colocation". While exploring the atmosphere, when using React App, below files are created. Lets understand whats going on in these files.

Index.js file consists of the root code to start the app which is auto generated by CREATE-REACT-APP package installed to create react apps. The app.js file is the main component of the react app. In this, all the sub components will be managed.

4.3.4 React- Router

This bundle gives the core routing functionality to React Router, however you might not have any desire to introduce it straightforwardly. On the off chance that you are composing an application that will keep running in the program, you ought to rather introduce respond switch dom. So also, in the event that you are composing a React Native application, you ought to rather introduce respond switch local. Both of those will introduce respond switch as a dependancy.

A single-page application (SPA) is a web application or site that connects with the client by progressively modifying the present page as opposed to stacking whole new pages from a server. This methodology keeps away from interference of the client experience between progressive pages, influencing the application to carry on increasingly like a work area application. In a SPA, either all fundamental code – HTML, JavaScript, and CSS – is recovered with a solitary page load or the proper assets are progressively stacked and added to the page as essential, ordinarily in light of client activities. The page does not reload anytime all the while, nor controls exchange to another page, despite the fact that the area hash or the HTML5 History API can be utilized to give the observation and traversability of independent legitimate pages in the application.Interaction with the single page application frequently includes dynamic communication with the web server in the background. The biggest difference is that navigating a single-page app doesn't involve going to an entirely new page. Instead, your pages (commonly known as views in this context) typically load inline within the same page itself. With multi-page apps, these three things come for free. There is nothing extra you have to do for any of it.

With single-page apps, because you aren't navigating to an entirely new page, you have to do real work to deal with these three things that your users expect to just work. You need to ensure that navigating within your app adjusts the URL appropriately. You need to ensure your browser's history is properly synchronized with each navigation to allow users to use the back and forward buttons. If users bookmark a particular view or copy/paste a URL to access later, you need to ensure that your single-page app takes the user to the correct place. To deal with all of this, you have a bucket full of techniques commonly known as routing. Routing is where you try to map URLs to destinations that aren't physical pages such as the individual views in your single-page app. That sounds complicated, but fortunately there are a bunch of JavaScript libraries that help us out with this. One such JavaScript library is the star of this tutorial, React Router provides routing capabilities to single-page apps built in React, and what makes it nice is that extends what you already know about React in familiar ways to give you all of this routing awesomeness.

4.3.5 JSX

This funny tag below is neither a string nor HTML. It is called JSX, and it is a syntax extension to JavaScript. We recommend using it with React to describe what

the UI should look like. JSX may remind you of a template language, but it comes with the full power of JavaScript. React doesn't require using JSX, but most people find it helpful as a visual aid when working with UI inside the JavaScript code. What this means is that the JSX we write is for human (and well-trained cats) eyes only. When this JSX reaches our browser, it ends up getting turned into pure JavaScript. As we've been working with JSX, you probably noticed that we ran into some arbitrary rules and exceptions on what you can and can't do. In this section, let's put many of those quirks together in one area and maybe even run into some brand new ones.

4.4 Implementation

The whole process of implementing the app starts with designing. We need to replicate the actual concept with simulation. So, once the design is fixed, the main task is to develop the project layout. In this case, we should design analyse all the required components used in the xplore atmosphere concept. So, the next step is to convert the physical attributes and elements into desingnable components. Here, we have 5 layers, i.e

- Troposphere
- Stratosphere
- Mesosphere
- Thermosphere and
- Exosphere

In each stage, we require differnt components like ozone layer, satellite ,space craft, aurora, rocket ,space shuttle ,meteros , parachutes, clouds ,air crafts ,mount everest etc. Some of them are reusable components. So, the components should be designed to maintain the reusability. Moreover, we need to use the project management tools extensively. That enables the ease of development and the stability of our code. In that case, we use kanban boards to plan and develop the components in gitlab. Dividing the works among the team and managing them is well maintained by using these tools. We need to make our apps as SPA's i.e Single Page Applications where the whole page doesn't get reloaded when we navigate through our stages in the app.

To perform Single Page Application, React JS doesn't have any built in functionality whereas Angular is packed with it in its framework itself. So, to enable its support to single page application, we need to install React-Router-Dom. Router may seem to be a bit complex word but this package makes it very easy to develop nested structures to

navigate through the views only reload that are intended to change. We use Switch, Router, Redirect from React-Router in the Main Component to define the navigation or the url to navigate when a component is requested by an event. We enclose the controls in Link for normal links or buttons and NavLink for NavBar comonents. When the button enclosed in Link tag is triggered through DOM, the Router in the main component open the requested url by the Link and reloads the component specified by the Router. In case of invalid URL or Link, the default component is reloaded using the Redirect method from React-Router.
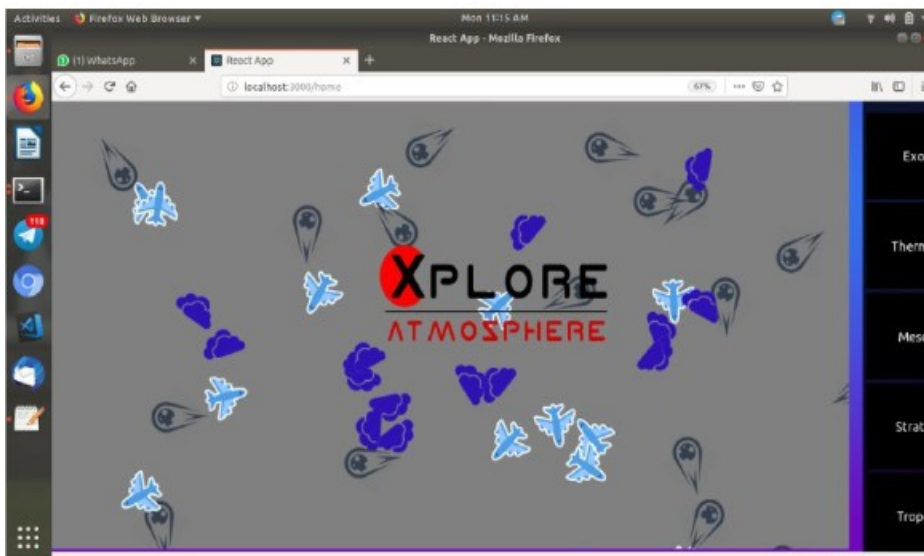
4.5 Outputs & User Manual

Figure 4.5.1:-Redirecting to Home
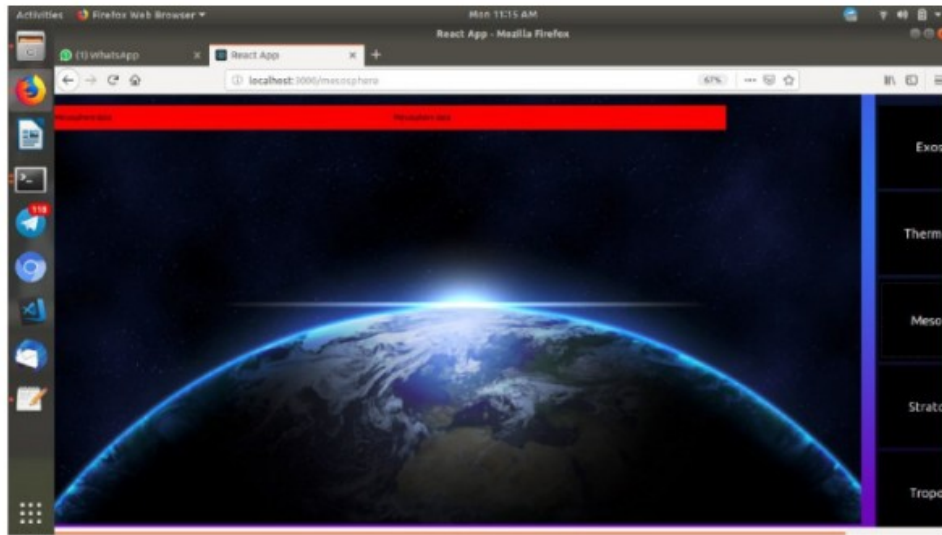
Xplore Atmosphere

Figure 4.5.2:-Layers page

CHAPTER 5
CONCLUSION

In this project, we have designed few simulations like Water Cycle, E-litmus, Xplore Atmosphere etc which are helpful for learners from primary education and secondary education. This aims at bridging the digital divide between the facilitated and the unfacilitated. This is an open source project and it facilitates further development by providing the strict documentation and installation guides to setup the development environment. Any new contributor can easily access, setup the development environment and start working on this project. All these contributions will be pushed to balaswecha project and then can be used in the digital education schemes. This can be extended to not just reuse the components, but also make a component library and make it possible to build new applications faster. Apart from this, with the exponential growth in technology, developing apps for just PC's is not just compatible with the development standards.

CHAPTER 6
FUTURE SCOPE

As cited earlier, this project aims at developing simulations for school students and improve their learning standards. So, for this development of applications, we can further implement this project with a library where new developers can easily build new applications faster. The main objective of choosing React JS to build our web apps is to use its component reusability feature extensively. This can be extended to not just reuse the components, but also make a component library and make it possible to build new applications faster. Apart from this, with the exponential growth in technology, developing apps for just PC's is not just compatible with the development standards. So, we need to make the apps responsive so that they fit into any screensize and adjust accordingly. This includes mobiles, tabs, laptops etc. We need to standardize the way we build these applications so that the existing codes will be able to merge into new applications. When we develop a new application, we need to make sure we use the existing libraries and also make the new components compatible for reusability.

CHAPTER 7
REFERENCES

https://www.balaswecha.in/

https://en.wikipedia.org/wiki/Litmus

http://apscert.gov.in/ebookapp/ebook_page.jsp

https://www.wikihow.com/Do-a-Litmus-Test

https://scied.ucar.edu/shortcontent/troposphere-overview

https://reactjs.org/docs/getting-started.html#learn-react

https://developer.org/en-US/docs/Web/JavaScript/Guide

https://www.conserve-energy-future.com/water-cycle.php

https://en.wikipedia.org/wiki/Education_in_India

https://www.livemint.com/politics/policy/how-privilege-shapes-learning-outcomes-in-india-1548086593289.html

https://www.thehindubusinessline.com/blink/talk/mouthful-of-privilege/article9838299.ece

https://www.thebetterindia.com/9343/ananyas-unique-approach-education-underprivileged/

https://www.downtoearth.org.in/coverage/educating-the-underprivileged-22238

https://yourstory.com/2013/06/aiming-to-provide-quality-education-to-less-privileged-girls-unnayan-learning-hub