

# Eduract: Creating Experiences for Online Learning

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This research aims to design a user-friendly, interactive experience for the online classes by optimizing the interaction among teachers and peers, that also gives users the ability to play an active role in taking the initiative to make learning more effective by implementing Augmented Reality and/or Virtual Reality technology in the current scenario of education. The objective of this research is to make students attentive and motivated to take online classes by improving their experience as the conducted survey showed that students find it monotonous and boring, which makes them inattentive, which leads to distraction and loss of focus during the conducted online sessions/classes. This research has chosen online classes as an entry point through different experiments with AR/VR technology, helping us to construct immersive user experience for online classes.

## 1 MOTIVATION

As the world is fighting to stop the spread of corona, one of the ways to stop its spread was to practice social distancing and quarantine people, which led to most of the institutes shifting to an online mode of teaching as a temporary solution. The online education was a substitute so that the learning of students is not compromised. Although the existing solution of attending online classes allows students to have some learning, it is not the best solution as it has many issues like minimal interaction between professors and peers as they are not able to interact and communicate well with each other. This has resulted in students losing their focus and motivation to attend classes, which is an obstacle in the learning process. This is an interesting problem because it is not only faced by students but also the majority population of society dependent on the online mode of learning. This motivated us to propose a medium through which the interaction could be livelier and more dynamic.

## 2 PROBLEM STATEMENT

School/College students lack the motivation to attend online classes because they find it monotonous, leading to distraction and loss of focus due to minimal interaction and communication between the Instructor and peers.

## 3 PROOF OF SIGNIFICANCE

The response we got for our survey was astounding. More than 500 people had filled our survey ranging from age 12 to age 52, possibly all the people taking online classes—the majority of our target audience were high school students from class 9th to 12th and undergraduate students. A large number of people were having the same problems, which included minimal interaction and the monotonous way of learning which was making them lose motivation to study. We reviewed the academic literature to verify the novelty of the problem. We found papers related to education, Augmented and Virtual Reality. Still, none of the papers justified the difficulties faced by the students. Our situation got more concrete after we took interviews with our audience, we got to know about their concerns, goals, aspirations and frustrations. We did some mind mapping and affinity mapping to understand the root of the problem. Scenarios and storyboarding were done to know where the current system of education lacked after doing all our initial research, we were directed to our problem statement which suggested minimal interaction and monotonous study had lead to the loss of focus and interest, which is an alarming problem.

## 4 RESEARCH & REQUIREMENTS FOR OUR PROJECT/PROBLEM/IDEA

### 4.1 ACADEMIC LITERATURE

The main purpose of our literature review was to gain a better understanding of online education and its influence on the students whose educational potential is being stable. We wanted to be sure that the problem statement we were tackling was either identified by researchers as a relevant issue for which we explored various papers to understand the literature behind the proposed solution. We wanted to be sure that VR be an appropriate medium for the domain we were working on. We want to make VR an effective and enjoyable medium for the users.

So, to understand the problem we wanted to start from the roots, so we did some research [1] and got to know that when the first three courses in Computer Science were free, it created an explosion of interest in Online Education which attracted more than 300,000 students. It also talked about what made online education boost even after it being around in various forms in 30 plus years and will be a savior for higher studies. It supports our claim about how important online education has become in the current scenario where everything is online. This study structured our claim about why online education is important but is getting hampered due to the current form of teaching.

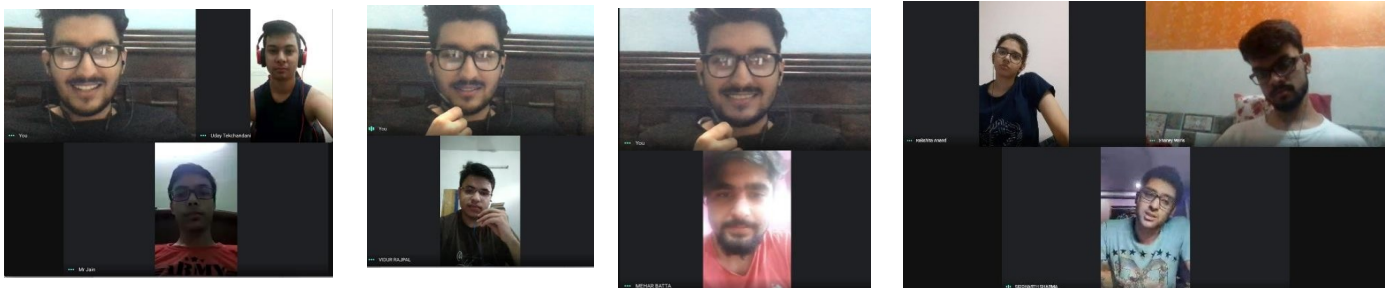
Further research, studies [2] were conducted on a Korean 6th class underprivileged student who was given online education to understand the efficiency. Different methods were used to analyze both ways of education. With the help of online and offline teachers which showed a higher achievement, performance result. The help of both the medium is more effective in online mode of education. Different techniques were involved in order to test them. This research strengthened the problem we are working on as an offline traditional way of learning class provides better results than in an online class. It gave us the direction to convert offline teaching, with the help of technology into a virtual reality.

Now we wanted to research issues that students are facing or the skills they cannot acquire because of a lack of resources. Our understanding was strengthened by the paper [3] which talks about exploring new online ways of learning by focusing on the characteristics of the online learner and the tendency of how they are at risk. Understanding of how to implement online learning in the traditional classroom and to build a research model. We were not sure that involvement of technology to enhance learning will be fruitful and did our research, and got papers [4, 5] which strengthened our claim as the studies suggested how students have a problem grasping concepts in class which leads to discouragement attending the classes. So they propose an interactive way of learning by creating an AR space so as to enrich the learning experience and also bringing a QR based related robot which would be teaching concepts in AR so as to help student visualize the concepts and have a better understanding of concepts by making them clear the concepts made us aware that we were going on the right path and gave us the direction to work on in order to implement the traditional way of learning in online mode of teaching.

### 4.2 METHODS

#### 4.2.1 INTERVIEWS

We first introduced ourselves, our objective and then described our problem statement to the user.



### Interview questions

- Description of the user
- How has your experience in lockdown been?
- What are the problems do you face in lockdown?
- How is your experience of online classes? Do you feel irritated or you enjoy attending classes?
- How is your college experience online? If started?
- Is it any different from an offline semester?
- How are you taught in online classes?
- How are the labs done if you in a core subject?
- Is the teacher able to give the same attention as offline semester?
- Are teacher technology impaired?
- How will you improve the online learning experience?
- Which technology do you think can improve the online learning experience?
- Do you get recorded lectures and lecture slides?
- How's your motivation when you're attending a 9am class in online learning in comparison with offline learning?

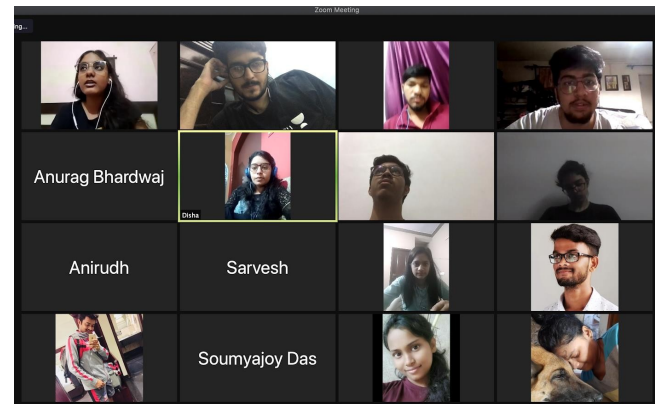
### Interview Insights:

- Students face network problems, lack of concentration, difficulty in explaining doubts.
- Teachers face problems with the new online education interface.
- Most of the students don't find online classes interesting.
- No doubts clearing in online classes.
- Offline classes are much more interactive.
- No practical lab sessions for core programs like civil, mechanical etc.
- Lack of motivation in online classes.
- No recorded lectures and lecture slides.
- Teachers are not much familiar with the technology in use.

## 4.2.2 GROUP STUDIES

### Group Insights:

- Less interactive than offline classes
- Too much screen time (Health problems) and buffering lectures
- Teachers are not used to online teaching.
- Lack of concentration
- Time wastage
- The teacher is unable to read all the doubts and answer.
- Teachers are not familiar with the technologies which lead to wastage of time and unsolved problems.
- Network problems



From soumya Mishra to Everyone:  
doubt shi SE clear nhi hota  
online pe

From Soumyajoy Das to Everyone:  
ab to private tuition teachers  
bhi online aa gaye hai lekin  
teachers late join karte hai  
class aur students wait karte  
hai.

From Shatakshi Chaturvedi to Everyone:  
online me boht tym waste  
hojata  
0 concentration  
spamming me time jata

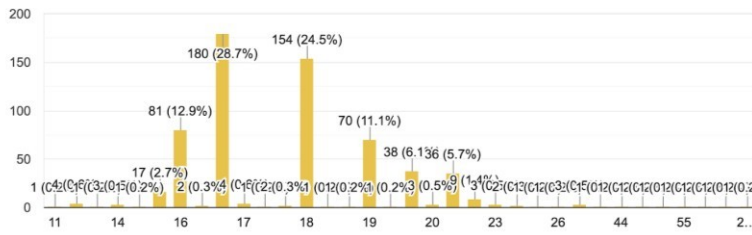
From soumya Mishra to Everyone:  
me zoom pe class ki h online  
class local coaching se...  
but local teacher ka  
technology knowledge jyada  
nhi hota...  
network issue ke wajhse bahat  
bar class postpone karta padta  
tha  
karna\*  
aur screen time badh ne ka  
badd....  
book padhne me interest km  
ho jati he

### 4.2.3 SURVEY

We got 628 responses survey responses. Below are the demographics:

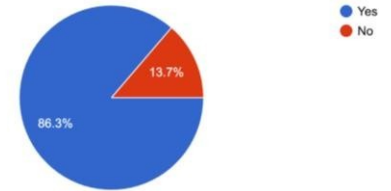
What is your age? (in years)

628 responses



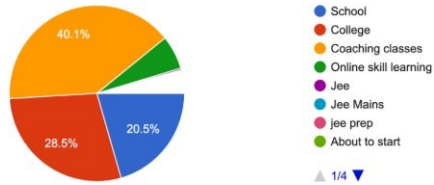
Has your online school/college/coaching started?

628 responses



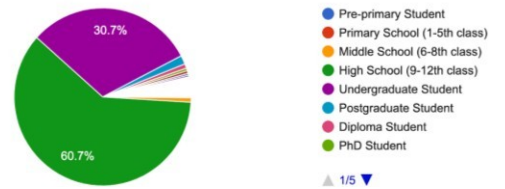
You are attending online classes for?

628 responses



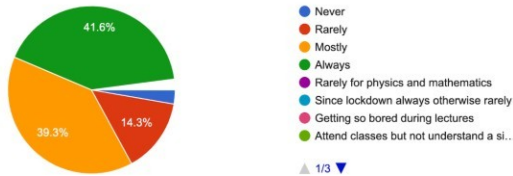
What is the current level of your education?

628 responses



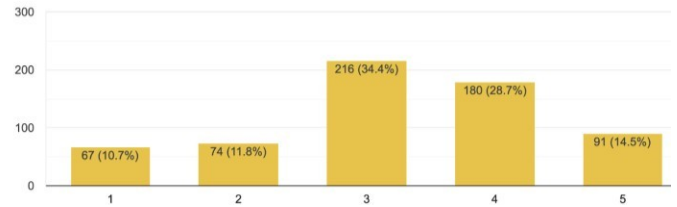
How often do you attend your online classes?

628 responses



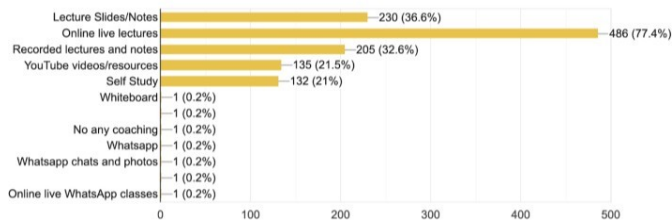
How attentive are you during your online classes?

628 responses



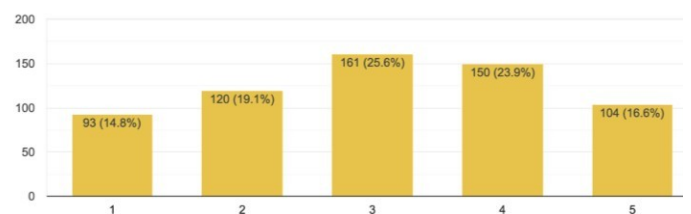
Which medium is your school/college/coaching using for implementing online teaching?

628 responses

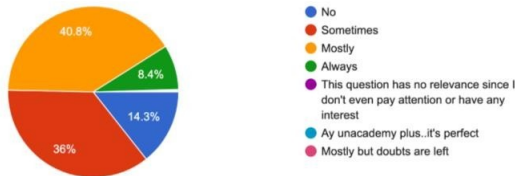


How satisfied are you with the content taught in the class?

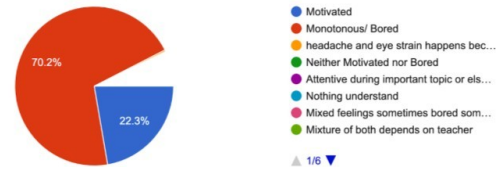
628 responses



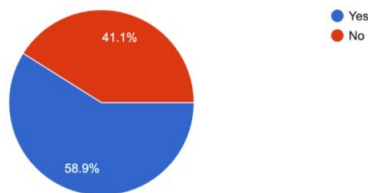
Are you able to focus or comprehend the concepts taught by your teachers in an online class?  
628 responses



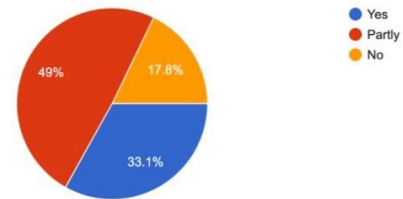
How do you feel while attending online classes?  
628 responses



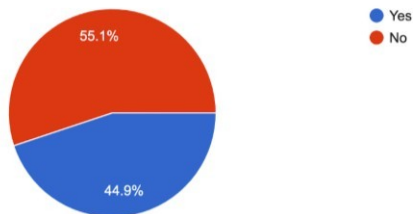
Are you able to ask your doubts in an online class?  
628 responses



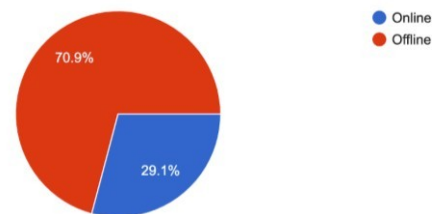
Is the professor able to understand your doubts?  
628 responses



Are you able to get your doubts cleared in an online class itself?  
628 responses



Which mode of teaching do you prefer?  
628 responses



### Findings:

- 86% of participants are taking online classes.
- Participants are taking online classes in schools, colleges, online coaching's and online platforms for skill learning.
- The survey includes school students (primary and secondary), college students (undergraduate and postgraduate) and PhD students.
- 70% of the participants find online classes boring and monotonous.
- 68% agreed that the professors are unable to understand doubts during online classes and doubts of 55% participants are left unsolved.
- 71% of the participants prefer offline mode of learning.

### Insights:

- Students find online classes useless.
- Distraction (Mind deviating towards YouTuber, Facebook)
- Less interactive than offline classes
- Students are less attentive in online classes.
- Students are unable to understand all the concepts completely.
- No study environment as you're not with other students in the class.
- No social interaction.
- No discipline and motivation.
- Network/ internet connection issues.
- Unable to clear doubts

- Too much screen time (Health problems) and buffering lectures
- Voice is unclear.
- The slide's text is not much visible.
- Time wastage due to teachers being less familiar with the technology.
- Platform related bugs.
- Headache and neck pain
- No practical learning in subjects like chemistry, physics.
- Teachers are not used to online teaching.
- Learning with laptops is fine but those who use mobiles face problems.

#### 4.2.4 DIARY STUDIES

We have chosen this method because it will help us understand our users because we got a better and deeper understanding of their moods during the classes and analyse the frustrations they had in daily classes. What made them feel good and what didn't We have chosen these 3 as because they come in the age bracket of our target audience. The duration of the study was a week long.

Insights from diary study:

**Name:** Abhinav Sharma

**Age:** 20

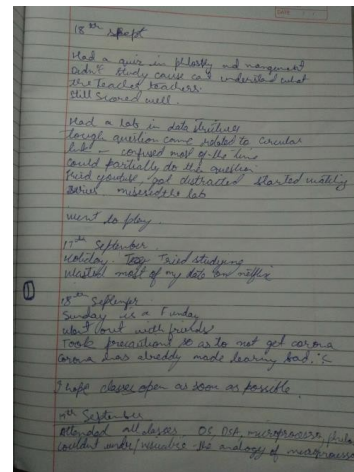
**Education:** 3rd-year BTech student

##### Insights:

Sleeps mostly during the class because does not understands lectures Grades are declining

Quite frustrated and confused most of the time Distracted by other distractions like youtube and Netflix Is shy and ask his doubts in the comment section

The teacher doesn't understand his doubts Boring lectures



**Name:** Vidur Raj

**Age:** 17

**Education:** JEE Aspirant & 12th class

##### Insights:

Facing health problems

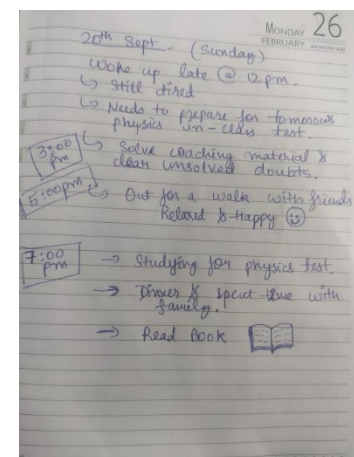
Sleep-deprived

Difficult to cope up with coaching classes and school classes Too much screen time

Unsolved doubts in both school and coaching

Boring lectures

Not able to spend with peers



## 4.3 Methods

### 4.3.1 AFFINITY MAPPING

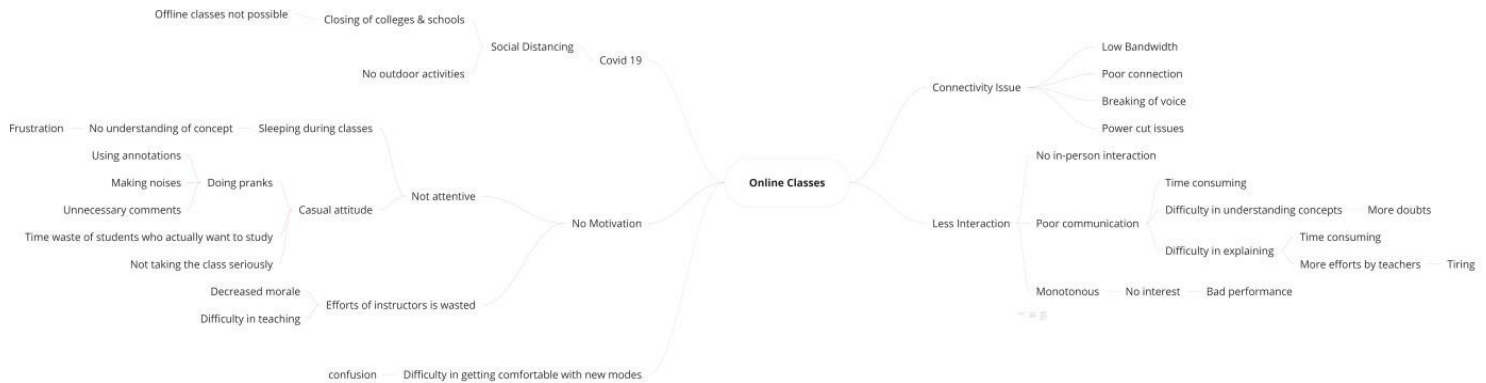
#### Affinity Diagram

Design of Interactive Systems  
Team 10 | WeDes4X





### 4.3.2 MIND MAPPING



### 4.3.3 COMPETITIVE ANALYSIS

#### MeetinVR

Strength	Weakness	Opportunities	Threats
Dynamic environment	Limited space for people to join	Evolution of technology as an experience is a booster	Fluctuation in the number of users
Interactive sessions	Use of heavy equipment	Beneficial for work from home	Tough competition from competitors
Can clear doubts Real time	Reduce of real time interaction	A boom in the IT industry	Dependency on government regulations
	expensive		Advancement of better technology

#### Verative

Strength	Weakness	Opportunities	Threats
Interactive way of providing solutions to concepts	Only one-way interaction	Evolution of technology as an experience is a booster	Advancement of better technology
Dynamic field of concepts	Use of heavy headset	Beneficial for grasping of concepts	Tough competition
Exploration of ideas real time	A platform for limited number of concepts	Revolutionize the evolution of studying	Dependency on government regulations
			People who can't Afford expensive subscriptions



### Spacial

Strength	Weakness	Opportunities	Threats
Formation of your 3D characters	Increase in impersonation	Evolution of technology as an experience is a booster	Advancement of better technology
No requirement Of headset	Limited free features	Research and discussion related fields	Competitors with a better business model
Collaborative and interacting way of learning	Limited reach base	Revolutionize the way of attending meetings	Dependency on government rules.
Instant character gets made			

### Zoom

Strength	Weakness	Opportunities	Threats
Virtual Meetings	Limited people can join in free version	Competitors as Google meet and Microsoft Team.	Fluctuation in the number of users
Screen sharin g options	Only 40 minutes of meeting in free version	Beneficial for work from home	Google meet brings Q&A and Polls to meetings to compete with zoom.
Chats, video and voice calls	Lack of interaction, No class like environment.	Google meet brings Q&A and Polls to meetings to compete with zoom.	Dependency on government regulations
Control options are given to the host.	Expensive. 13,000Rs for a year-long subscription.		Zoom Data Breach: Over 5 Lakh Zoom Login Data Being Sold on Dark Web for Less Than Rupee
Raise hand feature			
Schedule meetings			
Record Meetings			
Emoticon reactions			
Streaming on YouTube, Facebook using pro version			

### Why did we choose these competitors?





- Our main competitive analysis was based on companies which are already working in the domain of virtual collaborative for learning. We also choose Zoom as it is one of the most trending services for online classes.

#### 4.3.4 PERSONA & SCENARIO

##### Persona 1:



##### About Siddharth

 Age: 20Years  Status: Single  
 Occupation: Student  Location: Delhi  
 Education: Senior pursuing bachelors' in Computer Science

##### Description

Siddharth is a computer science student currently in his 3rd year who occasionally plays basketball with his friends. He aims to improve his CGPA in order to increase his chances of getting accepted into his preferable college.

##### Goals

Successfully earn a graduate degree with good grades that will allow him to advance in his career  
Getting placed in an A+ company  
Getting accepted at her top choice schools for Master/PhD  
Having a fun college life

##### Frustrations

Unable to understand concepts with the new curriculum of conducting online classes  
Nervous about missing the real college experience  
Connectivity issues during online classes  
Tensed about his academic performance.

##### Needs & Expectations

A better way to conduct online classes in order to increase interaction and quality of teaching.  
Expects the offline classes to begin soon.  
Wants to have clarity of concepts.

##### Scenario - 1

Siddharth has his morning lecture at 9:30 a.m. He wakes up at 9:20 a.m. and just makes up in time for his online class after brushing his teeth. He sits with his laptop on the bed and gets started with his class. Soon after the class begins, Siddharth becomes very uninterested and ends up sleeping while the class was still going on. His mother comes to wake him up and he ends up telling her that online classes are boring monotonous that he can't indulge properly and therefore gets distracted easily and ends

##### Persona 2:



##### About Pushp Jain

 Age: 17 Years  Status: Single  
 Occupation: Student  Location: Delhi  
 Education: School student (12th Standard)

##### Description

Pushp is a school student currently studying in 12th standard. He's from a science background. He aims to get under 5000 rank in IIT JEE and he's working hard for it. He has also joined Vidya Mandir classes to prepare for the exam. After COVID, he's using online resources to study.

##### Goals

Score good in 12th boards and JEE Main.  
Get CS in tier 1 engineering college.  
Establish his own startup and become a billionaire.

##### Frustrations

Unable to interact properly with professors during online classes.  
Not able to meet his friends. He feels alone and depressed sometimes.  
Sometimes he misses classes because of internet problems.  
Facing health problems due to excessive screen time.

##### Needs & Expectations

Expects that he gets his doubts solved in the class itself.  
He wants the class to be more engaging.

##### Scenario - 1

Pushp is a school going student. He has a busy day ahead. He has both his school and coaching classes to attend. He is unable to understand all the concepts properly during the live class and asks the doubt from the teacher. He took too much time to make the teacher understand the doubt as the teacher failed to understand it at first due to lack of interaction. By the time the teacher answered his doubt, it was already late to attend any more doubts Pushp and the other students had because the teacher had another class to

#### **4.3.5 PACT FRAMEWORK**

##### **4.3.5.1 PEOPLE**

###### **Primary Stakeholders:**

- High school students
- Undergraduate students
- Professors/Teachers

###### **Secondary Stakeholders:**

- Parents
- School/College Administration

###### **Tertiary Stakeholders:**

- Didn't find any stakeholders as of now.

###### **Physical Aspects**

- **Age:** Students (16-23 years) and Professor (70 max)
- **Gender:** Stakeholders are gender neutral
- **Height:** Average height of young adults

###### **Physical ability:**

- Majority of our audience are physically well, there might be rare instants of disabilities like speech, hearing and visual impairment.

###### **Psychological Aspect:**

- The stakeholders are mainly well-educated people, so they have the intellectual capacity to understand the changes.

###### **Social Differences:**

- Most of our stakeholders are proficient in Hindi and English both. Regional languages could be used but the main source of interaction would be English/Hindi.

##### **4.3.5.2 ACTIVITY**

- Classes should be interactive.
- Can easily understand what the professor is saying.
- A fair way to conduct online exams.
- Doubt clearing session.
- A more interesting way of teaching.
- No rote learning and doing deadlines just for the sake of it.
- A better way of communication.

##### **4.3.5.3 CONTEXT**

###### **- Physical Context:**

- All the activities will be happening indoors and involvement of each and every stakeholder may or may not be required. Also, a single stakeholder won't be able to distract other stakeholders
- E.g.: no unwanted annotation to break the flow or joining as impersonation.

###### **- Social Context:**

- The primary stakeholder might need not to worry about their privacy or data collection to take online classes, it is just to keep a check by the instructors to not let defaulters in or give any proxy attendance.
- E.g.: Just to get attendance, students join the class, switch off their mic and go to sleep.

- **Organizational Context:**

- Any of the activity will not disturb the method of online teaching. Students and professors if have doubt related to course curriculum can directly communicate the body in charge.

**4.3.5.4 TECHNOLOGY ANALYSIS**

- Augmented reality
- Virtual Reality
- Mixed Reality
- Headset
- Sensors
- Android

**4.3.6 AEIOU FRAMEWORK**

**4.3.6.1 ACTIVITIES**

- The students have been taking online lectures on their laptop or mobile devices.
- The students have been studying from recorded lectures and resources.

**4.3.6.2 ENVIRONMENT**

- Students are attending lectures in the comfort of their rooms.
- Disturbance from the surrounding.
- Family affair/issues.
- Neighborhood

**4.3.6.3 INTERACTIONS**

- Interaction of students with devices.
- Interaction of professor with devices.
- Students with their peers in the chat section.
- Between professor and student.
- Interaction via audio and video calls.
- Interaction with family.

**4.3.6.4 OBJECT**

- Devices (Laptop, mobile, Computer) to attend classes.
- Internet for studying online resources.
- Notebook, Pens/Pencils to write down notes.
- Video conferencing apps like Meet and Zoom as a medium for online class.
- Chair, Table, Beds, Sofa, etc.

**4.3.6.5 USERS**

- **Primary Stakeholders:**
  - High School Students
    - Role: Learning
  - Undergraduate Student
    - Role: Learning
  - Professors
    - Role: Teaching

- **Secondary Stakeholders:**
  - Parents
    - Role: Supervision and supporting of their ward.
  - School/College Administration
    - Role: Smooth functioning of Institutes.
  - Student Council
    - Role: Communication between students and school/college administration.

#### **4.3.7 REQUIREMENT GATHERING**

##### **4.3.7.1 USER CHARACTERISTICS**

- **Needs & Expectations:**
  - Increase interaction with professors and peers
  - Better ways to understand the concepts.
  - Able to comprehend what the professor is teaching.
  - Motivation to stay focused in the classes.
- **Goal:**
  - To study well
  - Maintain decent grades.
  - To lead a successful life.

##### **4.3.7.2 FUNCTIONAL REQUIREMENTS**

- An Interactive learning environment.
- A system that gives a better understanding of concepts.
- A system which helps in clearing the course related queries.
- A system which helps in eradication of proxy attendance.

##### **4.3.7.3 DATA**

- Audio.
- Gestures.
- Text, picture, video and 3d assets.

##### **4.3.7.4 ENVIRONMENTAL RESOURCES**

- Our product will work in all physical, social, organizational and technical aspects except some exceptions like physical disability, unable to understand the language.

##### **4.3.7.5 USABILITY & USER EXPERIENCE GOALS**

- Exceptions:
  - A correct feedback of all the problems they are facing in order to find a better solution for the problems.
- Subjective:
  - To bring a change on the perspective students have of online classes
- Objective:
  - To enhance the online learning experience.
- Usability:
  - Interactive, learnable, efficient and useful.
- UX
  - Simple, minimalist and engaging.

## **4.4 EVALUATION PROCESS**

### **4.4.1 EVALUATION PLAN**

- **What is our end goal?**
  - End goal for us is to bring an interesting and interactive environment so that students can experience traditional ways of learning through online medium without their learnings getting hampered and feeling demotivated about it. We are flexible to pivot with our technology but we propose to develop an interactive environment
- **How will you evaluate it? What metrics will you use to measure?**
  - The evaluation would be making our audience get the experience of the end goals. Ask them about their insights and adapt accordingly. This will help us make a more user-friendly product for our audience. The metrics to measure will be about how attentively they are attending classes. How regular are they with asking doubts and how comfortably are they interacting with instructors and peers?
- **When would you say you will be successful?**
  - We would say we will be successful when the problem statement proposed will get solved by the solution and people are able to experience and have an interactive environment to study which helps them build focus and be attentive in their classes.

## 5 IDEATION

### 5.1 How did we frame our design challenge?

#### **Our Problem Statement:**

School/College students lack the motivation to attend online classes because they find it monotonous, leading to distraction and loss of focus due to minimal interaction and communication between the Instructor and peers.

#### **Take a stab at framing this challenge as a question:**

How might we increase the interaction between undergraduate students, professors, and their peers in an online mode of education?

#### **Now state the key outcome you're trying to achieve:**

To maintain the level of the traditional way of learning so that the educational potential of a student is not affected by online learning.

To increase the interaction between the Instructor and Students so that the education does not suffer.

#### **Write down important aspects of the context or constraints that you need to consider:**

- Ease of use/Easily accessible.
- Environment noise/constraint.
- Comfortable wearable.
- User friendly.
- Shouldn't affect other people's private space.

#### **What are some possible solutions to your design question?**

- What if there was a class-like environment, where the students could interact with each other and teachers in virtual classrooms?
- What if there is a platform where the taught college lectures are taught in an augmented interactive environment and students could play with them.
- What if there is a platform where the Instructor and Students can Interact directly even if they are not in the same place?

#### **Does your original design question need a tweak? Try it again.**

Not as of now, but can change as per the future requirements.

## 5.2 10 Plus 10

### 5.2.1 STEP 1: State your design challenge

How might we increase the interaction between undergraduate students, professors, and their peers in an online mode of education?



**5.2.2 STEP 2: Generate 100 different design concepts of a system that addresses this challenge.**

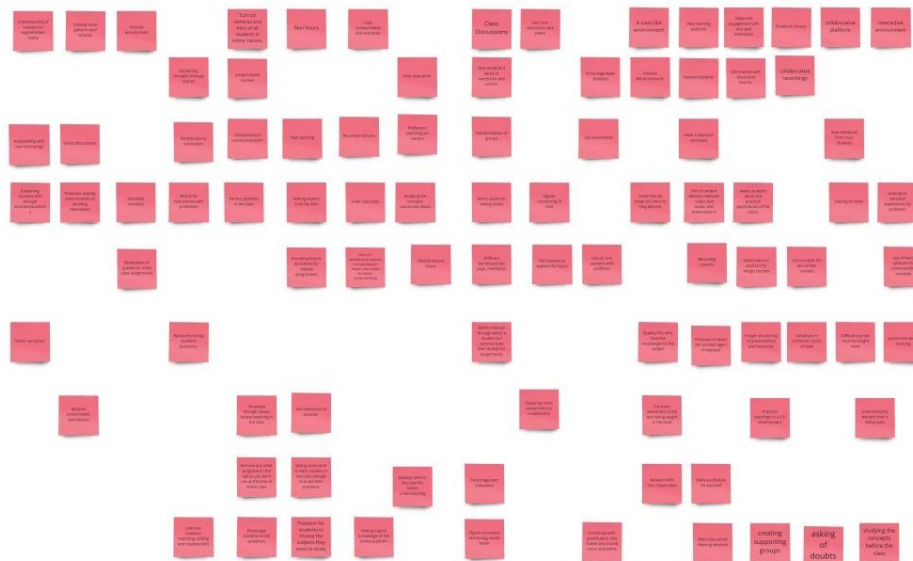
How can we make online classes more interesting/productive?



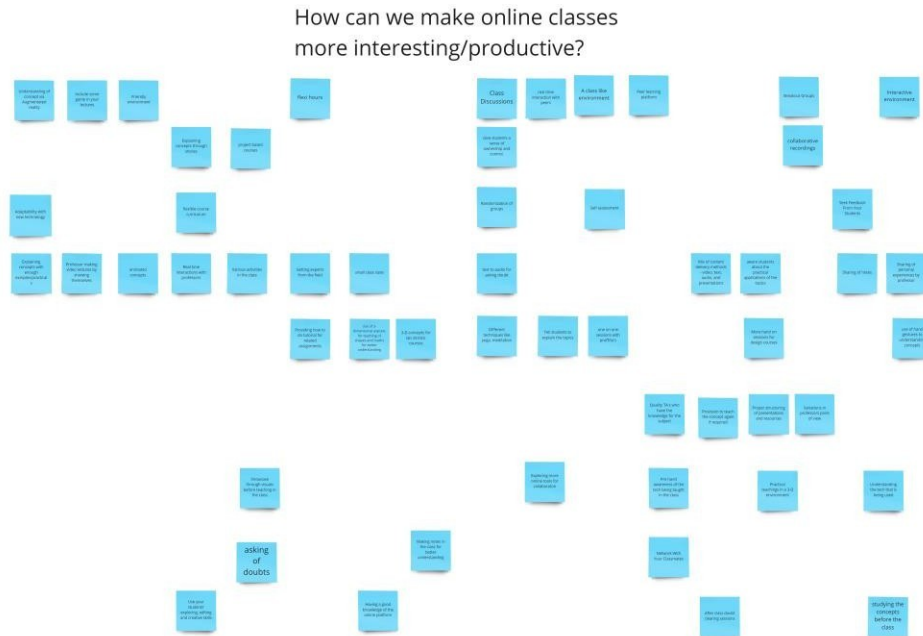
### 5.2.3 STEP 3: Reduce the number of design concepts.

- We started removing ideas in phases where for the first iteration, we identified more prevalent solutions and started removing the solutions which won't be influencing the problem we are working on after which we were left with 80 solutions.

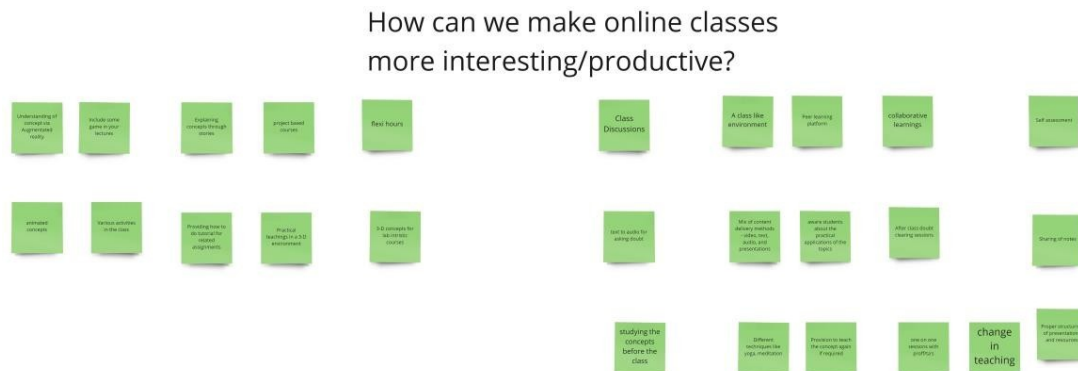
How can we make online classes more interesting/productive?



- For the second iterations we removed, ideas which were pretty vague which won't be able to make a better impact than the ideas which were not removed as they won't make a larger impact. We were left with only 50 ideas.



- For the Third iteration we removed ideas which were a subset of other ideas or similar ideas were removed and we were left with only 25 ideas



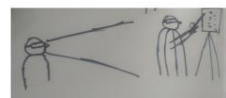
- For our final 10 ideas, we accumulated all the 25 ideas and we saw that mostly ideas were linked to some other ideas so we started linking these ideas and we were left with our final ideas after iterating over 25 ideas.

## How can we make online classes more interesting/productive?



### Our top 10 ideas to be converted into prototype.

- A virtual environment setup of a class in an online form of teaching where the person is able to interact with his teachers and peers real time.
- A new way of online assessment where students can first assess their own assignments, then by their group members and finally by other groups.
- Augmented reality to give students an experience to understand labs in 3-D to give them a feel of the technology.
- Conversions of all the written doubts in the text to make sure everyone understands the doubt without any issues and answer them.
- A virtual environment setup for everyone to collaborate real time to enhance peer learning.
- Augmented reality to give students an understanding of concepts.
- Having a virtual setup to make different activities in class.
- An online course structure which does not affect the traditional way of teaching.
- A platform for peer learning in order to create interactivity and enhancing the quality of learning.
- A better online mode of teaching which is interactive, non-monotonous and informative.



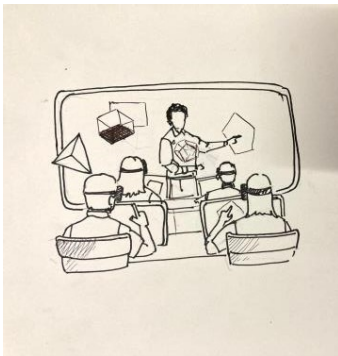
#### 5.2.4 STEP 4: Choose the most promising design concept(s) as a starting point

- We have chosen “A class like virtual environment” as our starting point because all other nine ideas are more or less the subset of this idea or were majorly related to it and seemed quite promising. We talked to a group of students, discussed our ideas and they could confirm with what we thought and seemed quite interested in the concept.

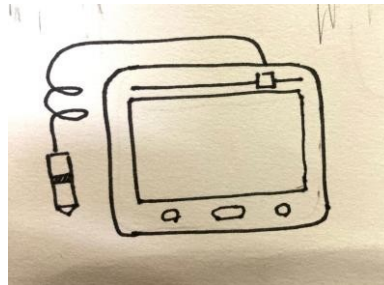
<image of most promising idea>

#### 5.2.5 STEP 5: Produce 10 details and/or variations of a particular design concept

1. App to connect a server for all the class students
2. Use of pen tablets to take notes.
3. Flexi hours for every student to clear their doubts (even if an absent student sees a recorded lecture, he will be able to experience it real time like the way students who attended the classroom)
4. Explain the 3D concepts in VR environment
5. A virtual locker where student can keep all their notes
6. virtual recording of whole lecture
7. Auto class notes of lectures taken by professors including the doubts asked by other students. (Voice to text converter)
8. Use of sensors on body parts (Hands, Head) to track movements
9. Audio generation of doubts by texting



1



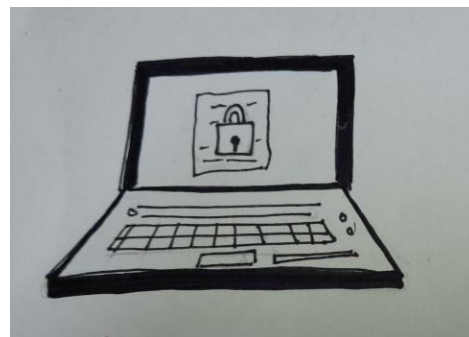
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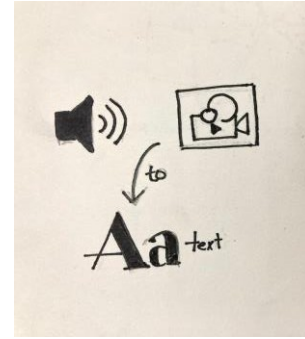
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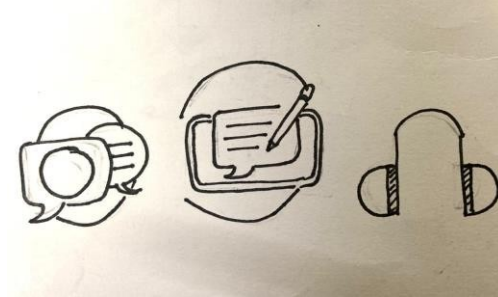
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#### 5.2.6 STEP 6: Present your best idea(s) to a group

- We have shown our main idea to the group of college students, who seemed quite interested in the idea which we showed them, they gave their insights how some of the features could be clubbed in order to make it more optimized
- Virtual recordings of lecture and the absent students could see the recorded lecture like the student who attended the class
- Instead of having different gestures for tracking movements and ask different queries they could be clubbed into one query.

### 5.3 Research through Design

**Problem:** The online form of education to continue the traditional way of teaching, so the educational potential does not get affected, is leading to monotony and minimal interaction between a student, their teachers and peers.

**Research Question:** "How can we design a solution to increase the interactivity and decrease the monotony among students in online classes?"

### **5.3.1 STEP 1: FIELD RESEARCH**

Our initial research was done via taking out survey, interviews, group study and diary entries.

**Knowledge:** Students are due to less interactivity in class, and increasing monotony of online classes is leading to loss of focus or reduce in the educational potential of an individual.

**Prototype:** It is not required here because we are observing the user and recording the moods and behavior of our user.

**Method:** Took interviews on individuals' basis as well interviewed a group of 10+ users and observed them.

**Procedure:** Observe the behaviors, moods of the user and record them

#### **Field study results:**

- Not able to grasp questions, because teachers reading just the slides
- Comfortable home environment
- Takes much time to a teacher, to take doubts or sometimes does not take only
- The teacher not able to understand doubts
- Distractions from other components
- Take it leniently, can't comprehend topics which require practical thinking.

#### **Derived hypotheses:**

People are losing the motivation to join online classes because they find it very boring and minimal interaction due to communication limitations and find it difficult to grasp the concept in an online environment.

### **5.3.2 STEP 2: LAB RESEARCH**

We got our problem statement, and we started ideating solutions to the design challenge we framed after doing our research about it.

**Potential Solution:** Increasing the interactivity and making classes interesting by providing the user with a class like an environment

**Knowledge:** Brainstorming different ideas to increase the interactivity by ideating over different ideas which propose a class like an environment

**Prototype:** Various concepts which increase the interactivity in classrooms

**Method:** Creating prototypes of all the finalized ideas which can be helpful

**Procedure:** Discuss the ideas with our users, try different types of testing, ideate according to the responses and analyze the results.



### 5.3.3 STEP 3: SHOWROOM RESEARCH

After we were done with our brainstorming, we finalized our final ten ideas in which there was one solution Virtual Classroom, which overlapped all other solutions and our users also seemed quite interested in our idea

**Potential Solution:** A class like an environment virtually, where you can interact with your peers and teacher real- time, communicating with gestures and understanding the concepts in 3-D

**Knowledge:** Will a classroom environment virtually in an online method of teaching will increase the engagement and make classes interesting?

**Prototype:** Making an app to connect a classroom on a network, wearing the headset, sensor (use of VR) to make gestures to interact to create a class like an environment virtually in online teaching

**Method:** Making the user the headset to the user, to get a feel of the classroom with concepts being taught in 3-D, with the sensors they could make hand gestures to create interactions while sitting at home for taking an online class

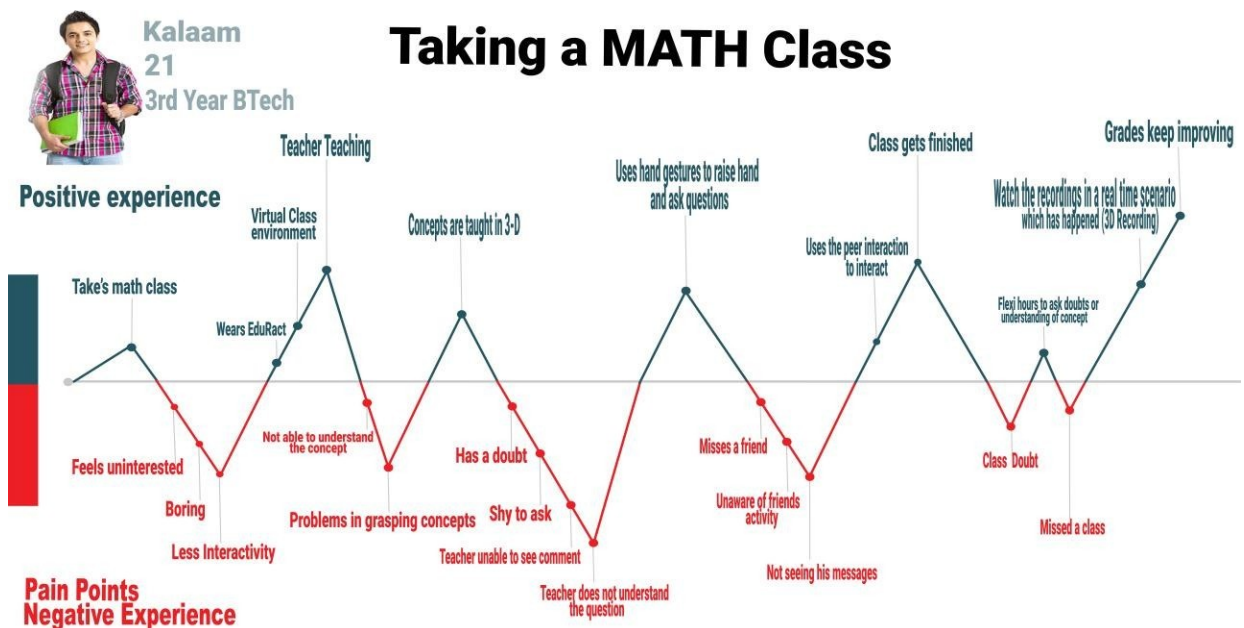
**Procedure:**

- Analyze the user's engagement with the prototype
- Checking the behaviors of the user
- Their constant moods.

**Quantitative:** Checking that the users are how many classes in a day of the total classes, week and month


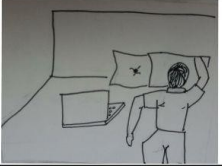




**Qualitative:** Observing and asking the user how does our prototype bring a change in their educational potential and how is their mood throughout different classes and is our solution challenges the problem they are facing now.

## 5.4 USER JOURNEY





## 5.5 STORY BOARDING

<b>Scene:</b> 	<b>Scene:</b> 	<b>Scene:</b> 
Wake up in the morning and join his online class.	After sometime, he feels monotonous and then sleeps. As a result, he missed his surprise quiz.	Wakes up after sometime and get to know, he missed his quiz and then feel sad about it.
<b>Scene:</b> 	<b>Scene:</b> 	<b>Scene:</b> 
He bought our system and on next day, he start using our product. He gets a class like environment virtually which increases his interaction with his instructor and his peers.	In the class he is taught concepts in 3-D, interacting with it, He asks his doubts by raising hand gestures.	Kalaam likes the new way of teaching and environment, which makes his learning interesting without affecting the educational potential of his. And his performance also gets increased.

## 6. LOW FIDELITY PROTOTYPING

### 6.1 SCOPE

#### 6.1.1 Why?

After our initial and mediating researches, we understood how did our problem originate i.e., minimal interactivity is losing focus in online class so as to eradicate that, we iterated over our design solutions in order to make interactive systems which will help us minimize the problem.

#### 6.1.2 What?

To help our stakeholders by solving their problem by designing interactive solutions from various different technologies such as AR, VR, and even mobile applications, which make the work of the user comfortable and helps them in maintaining their educational potential in online classes.

#### 6.1.3 Whom?

From our research PACT and AEIOU frameworks, we plan to make these interactive systems for our primary stakeholders, which are college-going undergraduates, with the influence of our secondary stakeholders, which are our teachers and professors.

### 6.2 IDEA 1

It is one of the most prominent ideas, as after brainstorming, all the ideas were somewhere being the subset of this Idea. This concept gives the user a virtual experience of their classroom in an online environment where they can interact with their peers and learn concepts 3-D to get affected.

**Level of fidelity:** Low to medium

#### **Method:**

We have done prototyping by starting on low-fidelity prototypes on papers by taking inspirations and also talking to our users about how usually they take their online classes in order to make a comfortable system. It was an iterative process. We drew lo-fi's on paper and then on some virtual platforms.

**Process:** Our initial prototyping was just rough sketches from the ten plus ten exercises. We further iterated them so as to understand how we would be syncing the interactive system with our user. Some of the questions to consider the constraints were:

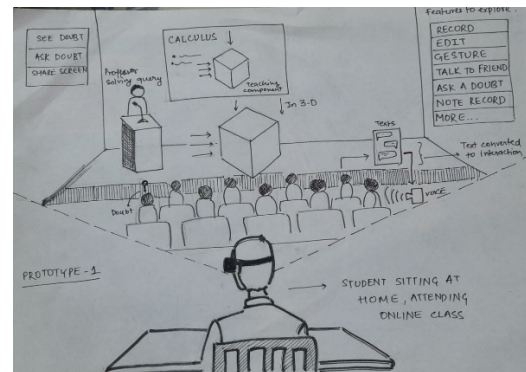
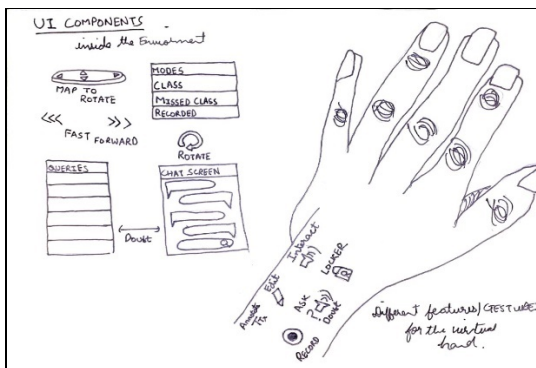
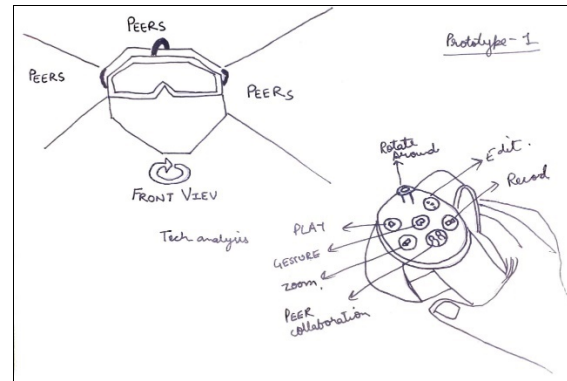
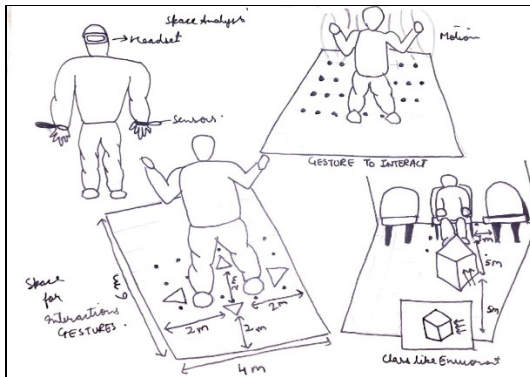
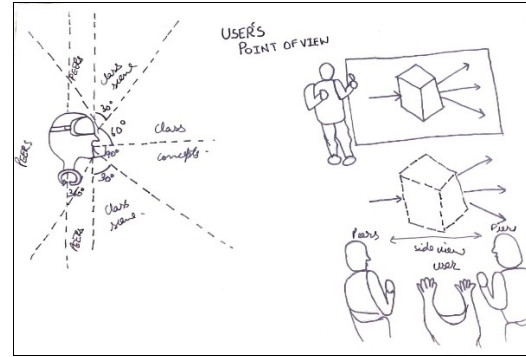
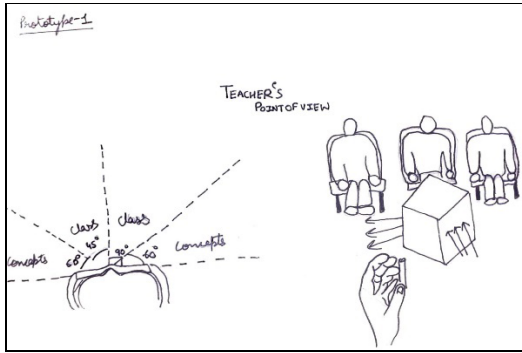
1. How do the users take online classes?
2. Minimum space required in order to see the class in virtual reality.
3. How comfortable will the user be with our system?
4. How to unify all the gestures.
5. Point of view of the student and teacher.
6. Obstruction from environmental constraints
7. Ways for interaction.

#### **Planning and Method:**

The team members made different iterations under the constraints we kept in the questions, we discussed the ideas taken to the best solutions and accumulated them into a common solution, and drew our prototypes accordingly. We did lo-fi's on paper and also tried prototyping in a virtual environment so as to get a better understanding of making a user-friendly system.

#### **Testing:**

When we discussed our idea with our users, they seemed quite intrigued by the concept of having an offline class experience virtually in an online medium. One of the major concerns was that obstructions through environmental obstructions might interfere and give an unpleasant experience. We solved this in our iteration of lo-fidelities by giving free space dimensions to our system.



**Prototype URL:** <https://drive.google.com/file/d/1FoVrLgSj-Da148ZtvYmty2CH9oD6DJ5y/view?usp=sharing>

### 6.3 IDEA 2

Accessibility is the key. One other idea was to improve the level of interactivity through smartphones, which is available to everyone. This gives the user the opportunity to learn and interact with concepts in real-time to understand them. They can also remotely interact with their peers to collaborate on the same workspace.

**Level of fidelity:** Low fidelity

### Method:

We have done prototyping by starting on low fidelity prototypes on papers, by taking inspirations and watching how they hold mobile phones to take online classes to see how they would prefer watching the concepts real-time on the phone and how easily they would be able to collaborate with their peers.

### Process:

Our initial prototyping was just rough sketches for the phone to use in AR with peer collaboration features on the concepts. We further iterated them to understand how we will be able to make accessible and easy to use for the user to increase collaboration.

1. How do the users take questions?
2. Do they prefer a horizontal or vertical way to use the phone?
3. Do everyone have a large screen phone.
4. How to distinguish different collaborations with peers?
5. Point of views of the student studying the concept
6. Ways for creating interfaces for different dimensions of the phone.

### Planning and Method:

The team members made different iterations under the constraints we kept in the questions; we discussed the ideas taken to the best solutions, accumulated them into a common solution, and drew our prototypes accordingly. We did lo-fi's on paper by making different iterations of our systems from different to making an accessible, easy-to-use, and friendly interface.

### Testing:

We also studied the user moods and frustrations and got a major insight that though the phone is accessible to the user due to small screen sizes, it won't be enjoyable and become a quite monotonous experience to keep changing the size of the interface. Still, if the user has a big-screen phone, it would be an interactive and enjoyable experience to have all the concepts taught in detail.

**Prototype URL:** [https://drive.google.com/file/d/1UpZwTeCfh\\_Fj1kjQGCQNXnpJ9hOVEN2B/view?usp=sharing](https://drive.google.com/file/d/1UpZwTeCfh_Fj1kjQGCQNXnpJ9hOVEN2B/view?usp=sharing)

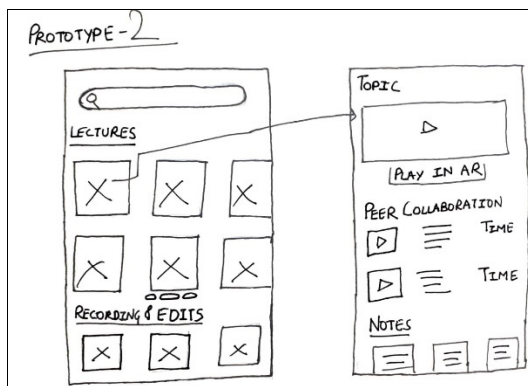


Figure 1: UI Components

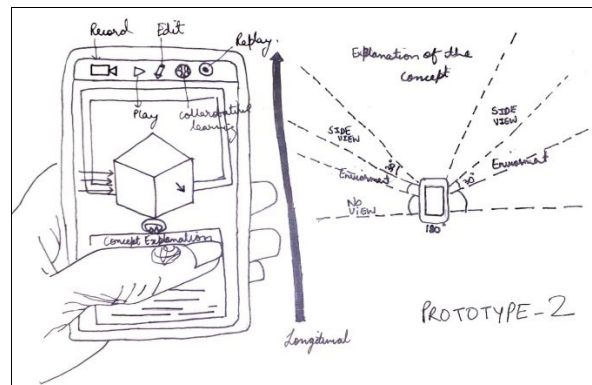


Figure 2: Longitudinal View

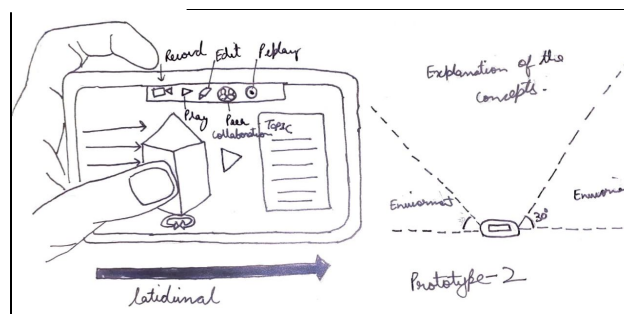


Figure 3: Latitudinal View

## 6.4 IDEA 3

This idea was explored in the form of a mobile application where we plan to change the format of online classes and increase the interactivity among peers. The assignment will be graded by the user, then by their teammates, and then among teammates to maintain transparency. In case of discrepancies in grades, the user can have a one on one conversation with the teacher.

**Level of fidelity:** Low fidelity

### Method:

We have done prototyping by starting on low fidelity prototypes on papers of a mobile application, which changes online classes' format by giving the user a platform to assess their own assignments to promote peer learning. In case of discrepancies, the user can have an individual or group video calls for teachers and peers,

### Process:

Our initial prototyping was just rough sketches for a mobile UI which changes the format of online classes by maintaining traditional learning promoting peer learning and interactivity among peers

1. How is the validity of the self-assessed assignment?
2. How do we keep a minimal UI?
3. Is the user flow user friendly?
4. Keeping customizable or universal icons in the UI.
5. Will this reduce redundancy in grades?

### Planning and Method:

The team members made different iterations under the constraints we kept in the questions. We discussed the ideas taken to the best solutions, accumulated them into a common solution, and drew our prototypes accordingly. We did lo-fi's on paper by making different iterations of our minimal UI to promote Peer learning and interactivity.

### Testing:

We also studied user moods and frustrations. We got an insight that self-assessing own grades would just lead to the clashing of peers, but if done properly, it can be a good asset to gain better grades and how our video call feature differs from google meet or zoom.

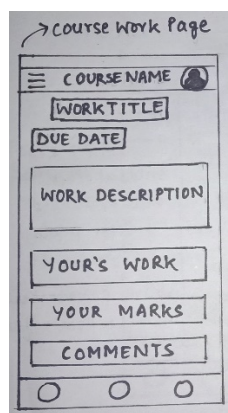


Figure 1: Course Work Page

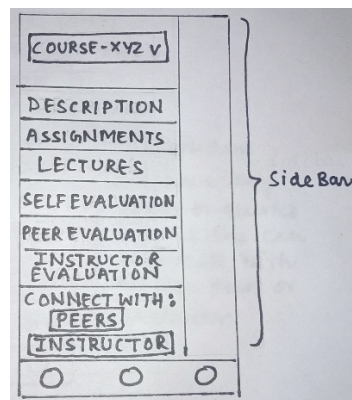


Figure 2: Side Bar Options of an app

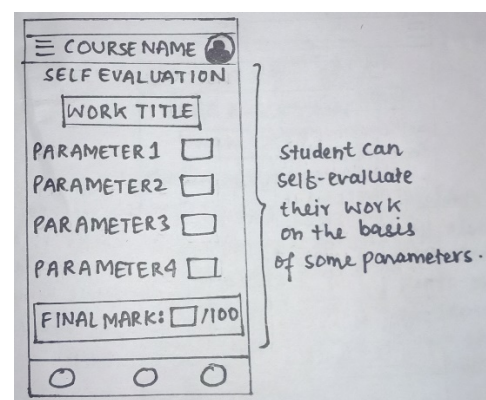


Figure 3: Student Self Evaluation

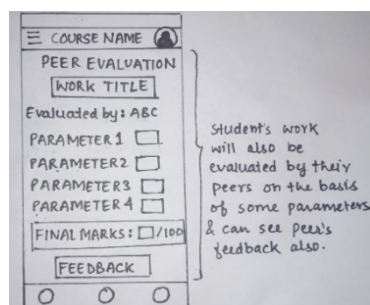


Figure 4: Peer Evaluation

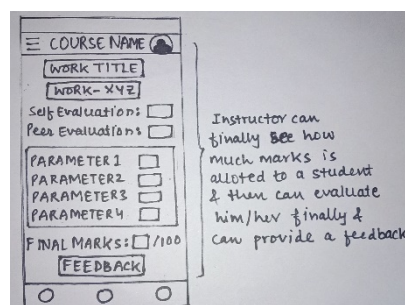


Figure 5: Instruction Evaluation

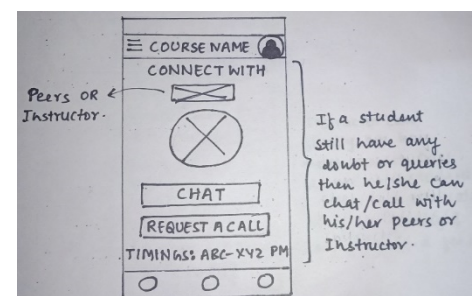


Figure 6: Connect with peers and Instructor.



## 6.5 RAPID USABILITY TESTING:

We did a rapid usability analysis with four potential users; we familiarized ourselves with them so to get natural responses from them. The users were told about the problem statement. They were shown lo-fidelity ideas with video explanations of the prototypes after which we asked them questions which were mainly divided into three parts while observing their reactions:

1. If given the experience of the prototype, how would you like to interact with it?
2. Critique our solutions with inquisitive thoughts
3. Give recommendations or thoughts behind the critique
4. Any suggestions for the prototype

### Idea 1:

They gave some medical issues like migraines, which could be removed by exercising or giving a break to the eyes after some time to maintain health. I had doubts about what if the student leaves the VR class open. The made us iterate over the solution and came up with that Inactivity with gestures would lead to removal from the class another question was that how would the backbencher be able to see? We decided to include a zoom function for clarity of concepts. Another concern was that obstructions through environmental obstructions might interfere and give an unpleasant experience. We solved this in our iteration of lo-fidelities by providing free space dimensions to our system. Discussion of doubt clearing and restrictive peer interaction was also talked about in the meeting.

### Idea 2:

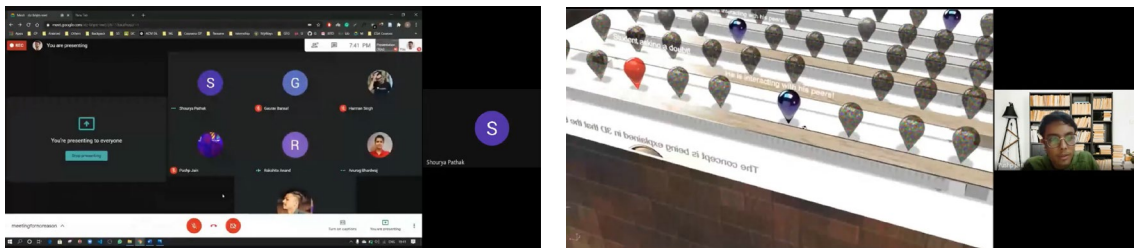
There was a long pause after explaining this idea after which one of the users asked that this would lead to a reduction in the interaction with the teacher. Availability of recorded lectures will lead to procrastination if they start using an application like this as they had the availability of reading these lectures whenever they wanted. They were not convinced and had a lot of queries with the application. One of the significant insights was that though the phone is accessible to the user due to small screen sizes, it won't be enjoyable and become a quite monotonous experience. They somewhat liked the idea of studying specific concepts in a video.

### Idea 3:

They had to be given a lot of brief information about the prototype before the user gave their insights. They found that so many rounds of checking an assignment would be time-consuming. Most users were silent, and one of the users showed that peer influence can be very subjective and can lead to a discrepancy. One of the users said that this would lead to transparency and removal of teacher's favoritism. Users also talked about how there might be clashes between peers and how our video call function from the zoom function for which we found an alternative.

### Final Verdict:

The users were asked which idea they were most interested in, and it came out to be idea 1. They found our idea 1 to be the best among all the three. Their suggestions were added in the final iteration of lo-fidelity.



**Discussion Link:** [https://drive.google.com/file/d/1xX\\_huGyjkagiLgmOt8IUnbxKbiqDVW1/view?usp=sharing](https://drive.google.com/file/d/1xX_huGyjkagiLgmOt8IUnbxKbiqDVW1/view?usp=sharing)

## 6.6 LEARNINGS:

Initially, our problem statement and the approach to it were vague. With proper ideation and requirement gathering, we were able to get a clearer understanding and work on a directional path to create solutions.

One of the most critical learnings as a team we understood is that the user plays an important role in structuring our solution ideas. Their insights give us the direction to work on it. We also analyzed that initially, from our research, we were trying to work solutions for all the stakeholders focusing on both primary and secondary stakeholders. Still, with ideation and prototyping, we became cleared and became more centric to focus on our primary stakeholders, with our secondary stakeholders influencing the solutions for creating our solutions.

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