LABS ONLINE – An Opportunity to Access High Quality Laboratory During COVID Breakout

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Abstract. Context: Students and job seekers are not getting any labs or practical experience using machines to be industry ready during the lockdown. Expensive machines are not accessible to these in general resulting in missed opportunities. Holistic remote learning of theory and lab is the need of the hour. With no proper remote training, their entire career will be at stake possibly causing damage to the machine or personal safety.

How can a great lab experience be offered remotely? The skills that Aarush has to acquire is challenging without good lab experiences.

Solution Approach:

- OpenGL on the web browser provides a 3D lab like experience to users from the comfort of their home.
- Using open source technology makes the solution cost effective. Technologies like Blender to create 3D models, A-frame for web framework for VR, Skectchfab for 3D marketplace, WebAR, Coffeescript etc.
- Users who are students and job seekers get an effective lab experience and worry less about burdening parents financially.
- Using Google cardboard can be an alternate solution for development in the future.

Viability:

- Futuristic technology that is not too expensive.
- The solution is viable for any time, however the lockdown has accelerated the urgency of such learning platforms.
- Collaborative and team learning features in the product stresses the fact "*during lockdown, remote learning need not be learning alone, it can be learning along*"
- It is the design for the new normal.
- The product is driven "by the community - for the community" to reach the masses in general. For example, 3D modellers develop the models, The teachers use the solution to enhance experience, students benefit with the viable solution and be confidently career ready.

Keywords: Labs online · Lab experience · Remote learning · Collaboration technology

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1 Introduction

1.1 Background

Learning becomes easier and understandable due to the access of the practical experiences and the great quality laboratories that the students and researchers get. Practical experience is greatly important as the theoretical knowledge for any domain. Also, virtual laboratories might assist the students in overcoming the problems faced by them in a conventional laboratory. As the global pandemic almost crippled the entire world, various sub domains of education, such as, access to high quality laboratories for the purpose of practical and hand on experience, got hit.

Study carried out in Slovenia shows that virtual laboratories help in better understanding of knowledge acquisition [1]. The virtual learning can improve student's understanding and also enrich their knowledge as per the outcome of the study carried out in Taiwan [2].

1.2 Problem Statement

Access to laboratories, that demands availability of high-quality machines, devices and other relevant instruments, got almost impossible for the students and professionals, mainly during pandemic.

2 Methodology

2.1 Design Thinking

During the entire period of research, we followed the Design Thinking Methodology [3]. Design Thinking refers to the cognitive, strategic and practical process by which design concepts (proposals for products, buildings, machines, communications, etc.) are developed (Fig. 1).

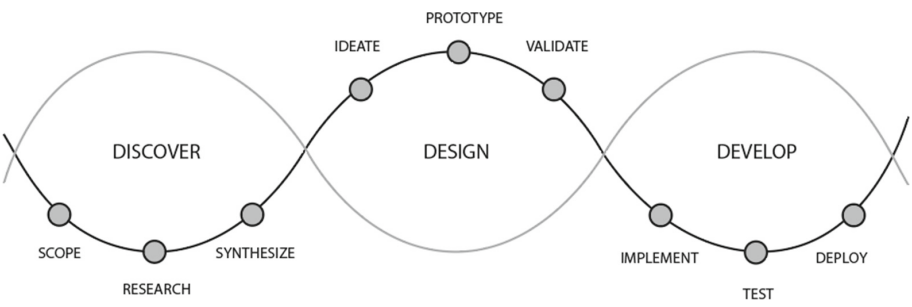
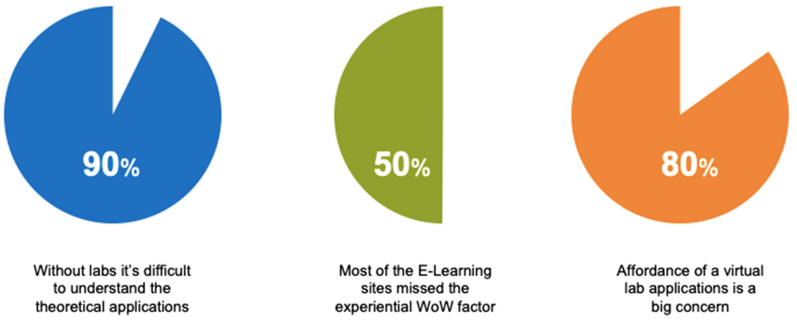
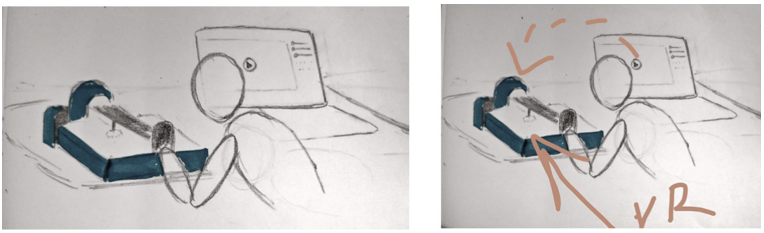


Fig. 1. Diagram showing the design led development process [4]

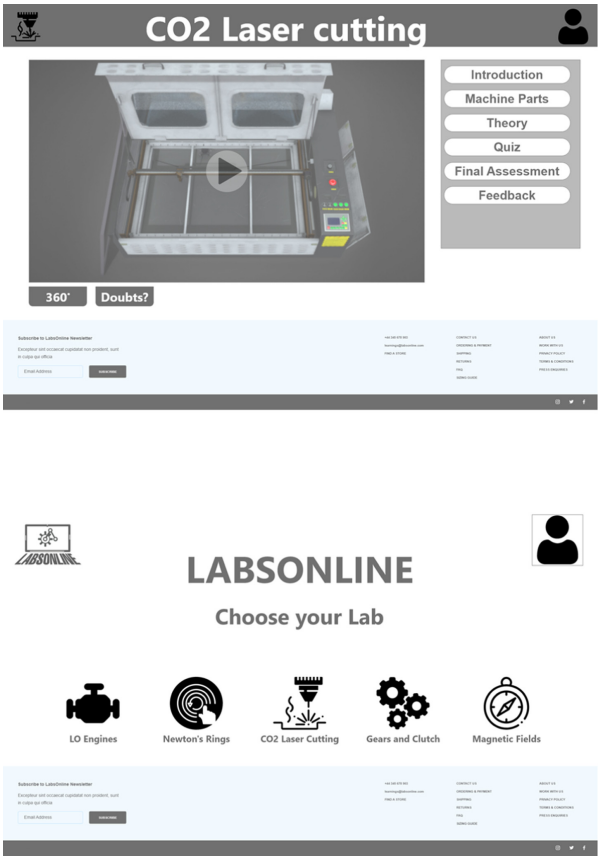
Research (Primary and Secondary). Observing and interviewing the users will provide many insights that will help in making educated decisions while building a product [5]. We interviewed 10+ users and conducted a detailed study on the various usages of laboratories, pain points faced, roles and responsibilities etc.



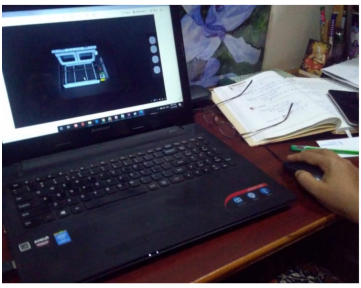
Ideate. This phase helps us to move from the problem to the solution, converge on the best approach, assess the viability and feasibility and visualize the experience through story boarding. [4]. Creating a detailed story board, empathy map, flow chart and mood board, logo design for the prospective solution helped us in visualizing the skeleton of the product more vividly.

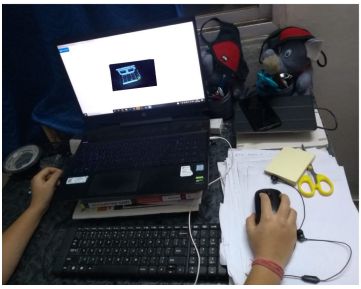


Prototype. The goal of the prototyping phase is to provide a low fidelity version of the design. Creating an actionable prototype with the appropriate data, charts, actions and controls gives an understanding of the prototype and its probable usage.



Validate. Verifying the focus of research and synthesis, evaluating the effectiveness of the design are few of the main goals of user testing/ validation. After the completion of the working prototype, we tested the product with 5+ users to validate the usability of the product created.





3 Impact and Result

3.1 Execution and Viability

LABSONLINE provides the following:

- Inexpensive futuristic technology.
- The solution is viable at any point in time, irrespective of the pandemic situation.
- Features related to collaboration and team building activities would ensure the mental health of the individuals as well, promoting "Not learning alone, but learning along".
- The product is driven "by the community - for the community" where the 3D modellers would develop the models, teachers would use the solution to enhance the experience, and the students would benefit with the viable solution and be confidently career ready.

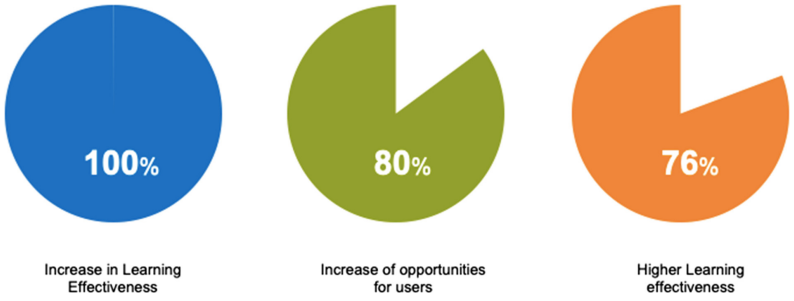
3.2 Impact

Learning psychologists, after studies [6] compared traditional teaching methods and virtual labs, it was tested that there was a 76% higher learning effectiveness with virtual labs over traditional teaching methods.

As for the teachers, combining virtual and theoretical knowledge along with a teacher mentoring resulted in a total of 101% increase in learning effectiveness.

- Revolutionary and effective distance learning
- Teachers twice as effective
- Improves the quality of lab education
- Students can perform on the machines almost like in the real world

- Remote learning need not mean learning alone, it can be learning along with options to collaborate
- Engages students with stories and quizzes in the video



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