Acquisition and user behavior in online science laboratories before and during Covid-19 pandemic.

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Abstract

The Covid-19 pandemic has resulted in the closure of schools at every level, globally, forcing education to move online. Meeting the needs of students online for Science Lab classes, in particular, is a challenge since the physical labs are not available to the teachers or students. OLabs is a virtual Science Lab providing a complete learning environment of theory, experimental procedures, videos, animations, simulations, and assessments that capture real lab experiences with the relevant pedagogy. This study looks at the acquisition and behaviors of users, on the OLabs platform, during pre and Covid-19 times. Using Google Analytics, we observe that, during the pandemic time, users increasingly adopted OLabs as a new learning pedagogy for performing experiments as indicated by parameters like the number of users; the number of unique pages viewed per session; time spent on viewing content; bounce rate; and preference for content types such as theory, simulations, videos, and animations.

1. Introduction

The recent Covid-19 crisis has impacted every social sector, and education is no exception. Throughout the world, schools have shifted to online classes. The long-term socioeconomic impacts of Covid-19 on education is yet to be known. However, this large-scale obstruction to the established teaching-learning paradigm is likely to affect over 1.6 billion learners of various ages. The World Bank projects that through the lifetime of these students, the monetary cost of this shutdown in terms of lost lifetime earnings could be up to $10 trillion [1]. UNESCO has claimed that the pandemic has disrupted the learning of 9 out of 10 students globally [2]. The closure is also more likely to affect disadvantaged communities and female students more acutely, with many being forced out of education as family income levels drop due to the pandemic [3]. The adverse effects are likely to be more pronounced in underdeveloped and developing countries where the education system is less capable of handling this sudden change. In addition, high - school students are more likely to be affected given the higher chances of dropping out due to financial vulnerability and the greater challenges involved in learning more complex topics [4].

India, with over 320 million students in school, is no exception to the challenges posed by the pandemic. Education in India is further complicated with multiple languages of instruction, and many state and national boards controlling the syllabi in various schools. In general, the approach has been to migrate to online education throughout the country. This has largely been necessitated by the nation-wide lockdown implemented for minimizing the spread of Covid-19. While the country has a relatively high mobile penetration, providing universal access to online education has been challenging and has been addressed with varying degrees of success by various states [5]. Despite the efforts, students, especially those in classes 9 to 12 are affected negatively by this shift. While theoretical topics can be taught online with a certain degree of efficiency, conducting laboratory experiments pose additional challenges. This has been addressed globally through online laboratories [6], the potential of which in the context of SDG 4 (on quality education) has been discussed in the literature [7]. Multiple platforms have been set up to address the need for laboratory learning. The EU for example uses a platform termed Go-Lab, which is set up via a consortium of 12 countries [8]. Labster is another application that provides online laboratories for high school students, largely targeting schools in the United States [9]. Similarly, in India, OLabs, funded by Government of India, has been the primary provider for online laboratories [10]. The platform was established before the advent of Covid-19 to provide low-cost lab access to students without the constraints of time and geography. The syllabus of OLabs is compliant with National Council of Educational Research and Training (NCERT) and Central Board of Secondary Education (CBSE), which is the syllabus followed by over 21,000 central government approved schools in India. Despite variations in regional boards, it is possible for state examinations boards to use OLabs with minimal modifications.

This study assesses the role of online laboratories in providing laboratory training to students in India during the pandemic. Specifically, focus is on analysing the acquisition and behaviour patterns of OLabs platform users before

and during Covid-19 using Google Analytics (GA). Note that in the context of this work, the terms online labs and virtual labs are used synonymously.

2. Literature Review

Online or virtual labs have existed since before the pandemic, providing affordable and accessible science and technology education. In fact, Science, Technologies, Engineering and Maths (STEM) online laboratories have been recognized as an approach to enabling safe and cost-effective exposure to these subjects without the limitations posed by geography or socioeconomic constraints. Lynch and Ghergulescu [11] review existing platforms for virtual online labs such as Go-Lab, which is an online ecosystem collecting online labs for worldwide sources aimed at European primary, secondary, and high school students. The platform allows instructors to build on existing courses, thereby providing an open platform for educational enhancement. Similarly, LiLa (Library of Labs) allows for online collaboration on virtual platforms. Chemcollective, Open-source Physics, and Random provide virtual chemistry, physics, and mathematics laboratories, respectively. Many of these existing platforms are open source and allow users to build on each other's work.

To mention a few more concrete examples, virtual laboratories have also been employed to teach basic electrical concepts [12], principles of material measurements [13], and engineering in general including the use of augmented reality [14], including the use of augmented reality [15]. More complex and specific subjects such as neurosurgery are also supported in this space. Though not exactly a virtual laboratory, Neurosurgery Atlas allows users to access information on neurosurgery. It has been shown that the information on this platform can be used to facilitate an online neurosurgery course [16]. Other universities have addressed the crisis by postponing laboratory courses to the coming academic year and delivering theoretical courses through online interfaces. This is especially true in core science and medicine [17]. In general, virtual laboratories are accepted as a viable alternative to traditional labs in imparting practical skills to students and professionals [18]. Virtual learning has also gained greater acceptance, especially among STEM students. Naturally, the relevance of such laboratories has become more evident during the Covid-19 crisis. However, a complete lack of practical experience may have adverse effects on students, and this will be the first time in recent history that high schools across the world are graduating students with little or no hands-on lab experience [19].

Using virtual laboratories instead or in combination with wet laboratories also has cognitive advantages [20]. Compared to direct instruction, virtual labs are more engaging [21] and compared to working with real laboratories in virtual laboratories students can more easily make quick exploratory experiments and virtual labs can show elements of a system that cannot be seen in reality. Overall, experimental studies show advantages in learning performance for learning from virtual labs over direct instruction and often also over real laboratories [22]. This work, however, also shows that the inquiry process involved in learning from labs should be supported to make it effective. This support can be given by the teacher, but also by providing students with supplemental material like in OLabs or with interactive apps like in Go-Lab. A second caveat is that students need to be prepared with the right prior knowledge before entering the learning stage with virtual labs.

The use of virtual laboratories became necessary when the facilities that sustain such endeavours were not yet in place. For example, an attempt at online chemistry classes in Rio de Janeiro was hampered by the lack of necessary technology (smart phones, tablets, or computers) among students of lower socioeconomic strata, lack of adequate training to faculty to address the shift in platform and pedagogy, and the limitations of the platform itself. In fact, without significant improvements, the approach would not be a valid substitute for chemistry laboratories [23]. However, an approach based on collaboration by a team of international instructors on how to facilitate laboratory style learning outside of the traditional platforms was more valued and had better utility [24]. It should be noted that the countries involved in this study were predominantly developed nations where students were more likely to have access to technology. The University of Toronto combined short campus visits and Labster enabled virtual laboratories to convey the necessary physics, chemistry, and biology lab skills to high school students during the pandemic [25].

In India, OLabs has been the key platform of online laboratory access for high-school students. The platform has over 173 science experiments, and nearly 10,000 teachers across the country have been trained [26]. Additionally, the platform is entirely free and provides animations, simulations, and questions aimed at providing a deeper theoretical understanding. Due to these benefits OLabs has an advantage over its alternatives in India. In fact, practical or laboratory exams carry 30% weightage for science subjects [27]. Earlier studies on OLabs have shown that while OLabs do not entirely replace the classroom experience, they do provide a platform for supplementary learning, allowing users to repeat experiments without any additional cost. This platform also provides a better understanding of the theoretical concepts, and most teachers favoured the use of OLabs [28]. The need for reliable technology was

also highlighted in previous studies, as teachers correlated the effectiveness of the software to its speed and responsiveness [29].

In general, the literature identifies online learning and virtual laboratories as usable learning interventions that can help students during this time of crisis. While there is no research to understand the effects of a completely virtual laboratory environment, it is safe to assume that eLearning platforms and virtual laboratories are likely to be a part of future education even after the pandemic [30]. Therefore, it is essential to understand more about their functioning and utility during the pandemic.

While there are reports that virtual labs were employed by schools, no scientific analysis on their usage during a pandemic situation is available. This study hopes to contribute to the literature by studying how a virtual learning platform like OLabs helped learners during the pandemic. OLabs is an appropriate platform for this study as it is free and easily accessible. This allows students of every economic class to access it. Additionally, given that it caters to CBSE, NCERT syllabus it will be relevant to students all over India, thus eliminating any regional or socioeconomic biases from the study. Learner access and registration is free and unlimited for all content, though students need to login to access some of the simulation content.

Our study paper is structured as follows: First, we review OLabs with its key features as it relates to this paper. Then we discuss the study methodology and related studies that have used Google Analytics (GA) for acquisition and behavior of users. Following this we interpret, and discuss research findings presented through statistical data collected by GA. Then the final section is about conclusions and future scope of research.

## 3.   About OLabs – Online Laboratories for Science experiments

OLabs for school lab experiments provide the ease and convenience of conducting laboratory experiments online using the internet. Experiments can be done less expensively and efficiently. At present, 173 OLabs in Physics, Chemistry, and Biology are available as open educational resource on http://www.olabs.edu.in/ All the labs are available in English and translated to local Indian languages like Hindi, Marathi, and Malayalam. For schools constrained with internet usage, an offline version is also available. Typically each lab will have 6 to 8 tabs for different skill types like theory, procedure, animation, simulator, video, resources etc. as shown in the Figure 1.
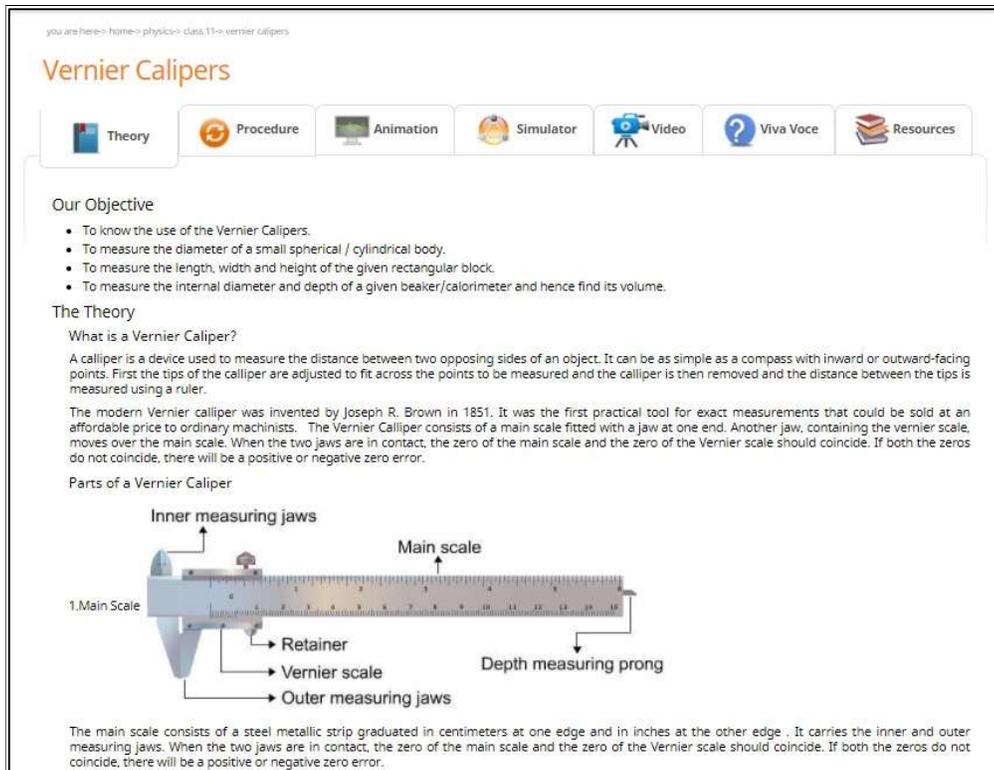
Figure 1. OLabs experiment showing different skill types.

OLabs platform offers tremendous flexibility for both slow and fast learners. Learners are free to choose any skill type and start their session. Some learners may start directly with simulation to learn-by-doing, as shown in Figure 2.

A typical learner would start with reading about the theory and procedure, then proceed to watch the video with animation, as shown in Figure 3.
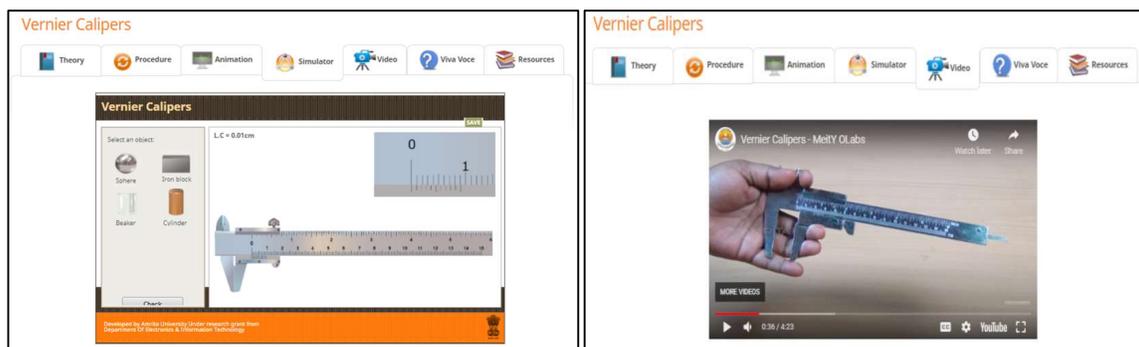
Figure 2. OLabs Physics experiment using simulation.   **Figure 3.** OLabs Physics experiment using video.

4. Study methodology using Google Analytics

Google Analytics was chosen, as it has already been employed for similar analysis in previous studies. For example, Google Analytics data of the Enocta Academic Education Platform (EAEP) was used to analyse user needs and behaviour patterns [31]. A similar approach was used to aid teachers in achieving learning goals of students using the eLearning environment Virtual W [32] and online courses [33][34]. Therefore, this paper uses Google Analytics data on OLabs to study how this platform was used during the pandemic to support laboratory education.

Google Analytics provides analytical information about the most viewed pages, number of unique visits per page, the average time spent on a page, the bounce rate, new visitors, and returning visitors used to access the pages and so on. [35][36]. Google Analytics also provided data on the type of devices used for access. Such information can allow us to consider whether developing a mobile app for OLabs would be helpful or not. The three main devices of interest to the current investigation were desktops, tablets, and mobile phones.

Several indicators from Google Analytics that would allow inference of a level of engagement for OLabs were retrieved and analyzed. Selected Google Analytic variables included user behavior, content analysis, how users were acquired, overall website engagement including pages visited per session, bounce rate, utilization rate of specific labs, and user access mode and location, etc.

For our study, Google Analytics usage data from April 1st to December 30th, 2019, was retrieved and compared to a similar timeframe in year 2020. We are calling Apr-Dec 2019 as pre-Covid-19 and Apr-Dec 2020 as Covid-19 period. We are assessing the impact of Covid-19 on school education and usage trends of OLabs between pre-Covid-19 and Covid-19 period.
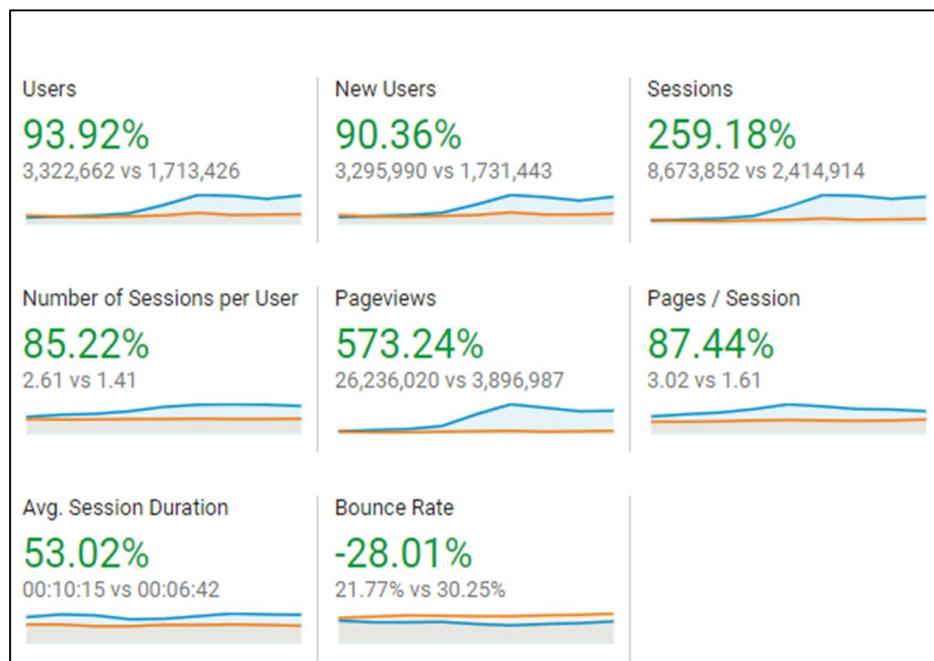
4.1 Definitions of the Google – Analytics indicators

- **Pageviews** - This indicator specifies the total number of pages viewed, including those viewed by the same user several times.
- **Unique Pageviews -** This indicator considers the number of unique users who have viewed a page at least once and eliminates user accessing the same page several times.
- **Avg. Time on Pages -** The average amount of time users spends viewing a specific page.
- **Bounce Rate** - It shows how many users leave a website after visiting only one page. For example, if you read a single article or page on a website and then leave, this is considered a bounce and is considered when calculating the Bounce Rate.
- **New vs. Returning Visitors** - New visitors are individuals that have not engaged with a given website in a particular time, while returning site visitors will have made a minimum of one visit to at least one page of a given site in that duration.

5. OLabs Analytics – usage, skill type, subject, gender, device

5.1 OLabs Platform usage trends

With the advent of lockdown and a greater need for online learning, there has been a marked increase in OLabs usage indicators like number users, number of sessions, unique views, and bounce rate, as shown in Figure 4. Overall, the total number of users has increased by 93.92% between Apr-Dec 2019 and Apr-Dec 2020. The number of new users signing into the platform increased by 90.36% during the same time frame. The number of sessions went up by 259.18%, showing an increased reliance on online learning. This is in line with expectations as most schools including government institutions were forced to shift to online teaching starting in March of 2020. Therefore, many new users would have relied on OLabs. Additionally, while earlier OLabs was at best a support instrument for education, many teachers would now be inclined to utilize it as a primary teaching resource, thus increasing the number of users as well as number of sessions. This is further illustrated by the increased session time, which went up by over 53% and the higher number of sessions per user, which increased by over 85%.

The genuine nature of this increase is best illustrated by the engagement of users with OLabs. For example, the number of page views increased by 573% and the number of pages viewed per session increased by over 87%. Additionally, the bounce rate, which measures the number of times a person enters and leaves a website from the same page without much engagement dropped by over 28%.

Users	New Users	Sessions
93.92%	**90.36%**	**259.18%**
3,322,662 vs 1,713,426	3,295,990 vs 1,731,443	8,673,852 vs 2,414,914
Number of Sessions per User	**Pageviews**	**Pages / Session**
85.22%	**573.24%**	**87.44%**
2.61 vs 1.41	26,236,020 vs 3,896,987	3.02 vs 1.61
Avg. Session Duration	**Bounce Rate**	
53.02%	**-28.01%**	
00:10:15 vs 00:06:42	21.77% vs 30.25%	

Figure 4. OLabs analytics dashboard comparing Apr-Dec 2019 and Apr-Dec 2020

During the pandemic year 2020, OLabs platform was accessed by 3 million users. Users increased from 14,908 to 36,700 monthly average, with new users increasing from 12,647 to 23,789, a clear demonstration of growing visibility and popularity of OLabs, as seen in Figure 5.
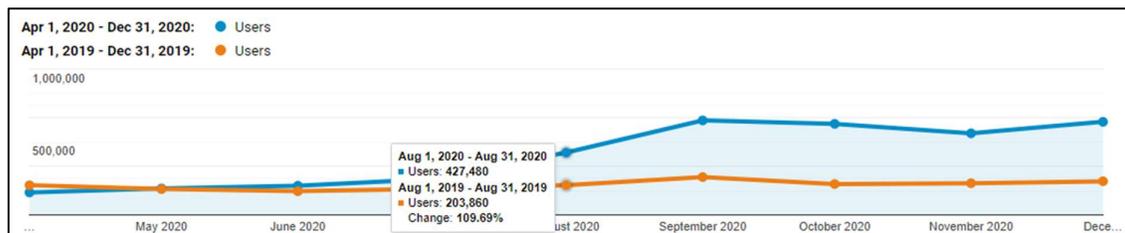
Figure 5. OLabs platform monthly usage comparisons between Apr-Dec 2019 and Apr-Dec 2020

In the data presented above, the role of OLabs in education has become more prominent during lockdown. This is in line with expectations as online teaching became more popular during the pandemic. By March 2020, India went into a complete lockdown, forcing all educational institutions to move online. This included schools, colleges, and higher-education institutions. Over the span of the next year various lockdowns and restrictions at national and state levels necessitated that most teaching, especially in schools, happened online. Since OLabs is designed specifically with

CBSE and NCERT school syllabi in mind, it is natural that many educators and students would have chosen the same for replacing laboratory experimentation. The fact that this platform is free for anyone to use has also contributed to its popularity, especially during the inevitable financial constraints brought about by the pandemic. Therefore, the increase in users and the number of new users is explained.

Overall, it can be inferred that OLabs became more popular during the time of the pandemic, with more learners utilizing the resources, and developing a higher engagement with the platform.

5.2 Most viewed OLabs

Learners had preference for labs of certain subjects and within that subject inclination for certain skill type like theory, simulator etc. during the Covid-19 period. Labs related to Physics subject (Ohm's law and resistance, Vernier Calipers, Screw Gauge and Vernier Calipers) were the most viewed followed by Biology (Onion and Cheek Cells) and Chemistry (Separation of Mixtures Using Different Techniques, Tests for the functional groups) as observed in Table 1. Learners from class 12 had much higher unique page views, an indication that they were more concerned with school closures and the impending school leaving examinations. While the theory skill type was the most viewed (Ohm's law and resistance), analyzing at count of views for simulator and average time spent on them, an argument can be made that those learners of theory skill type of Ohm's law and resistance and Vernier Calipers also used corresponding simulators to reinforce their learnings.

Table 1. Most viewed OLabs as measured by unique pageviews

Name of the Lab	Unique Pageviews	Skill type	Class	Subject	Avg. Time on Page
Ohm's law and resistance	2,22,798	Theory	Class 12	Physics	00:02:25
Vernier Calipers	1,32,498	Theory	Class 11	Physics	00:04:23
Ohm's law and resistance	1,24,846	Simulator	Class 12	Physics	00:09:41
Onion and Cheek Cells	1,19,411	Theory	Class 9	Biology	00:05:24
Screw Gauge	1,19,053	Theory	Class 11	Physics	00:04:38
Vernier Calipers	1,07,233	Simulator	Class 11	Physics	00:13:32
Separation of Mixtures Using Different Techniques	1,02,749	Theory	Class 9	Chemistry	00:08:43
Tests for the functional groups	83,675	Theory	Class 12	Chemistry	00:10:31
Determination of concentration of $KMnO_4$ solution	79,440	Theory	Class 12	Chemistry	00:04:23
Decomposition Reaction	78,108	Theory	Class 10	Chemistry	00:07:08
Screw Gauge (Simulator)	77,686	Simulator	Class 11	Physics	00:09:09
Study of Pollen Germination	71,698	Theory	Class 12	Biology	00:02:36
Single Displacement Reaction	68,641	Theory	Class 10	Chemistry	00:04:40
Separation of Mixtures Using Different Techniques	65,523	Theory	Class 9	Chemistry	00:26:42
The potentiometer- Comparison of emf	65,217	Theory	Class 12	Physics	00:03:49

5.3 Understanding learner preferences

Science labs are an integral part of high-school education and access to these labs were very limited during the lockdown. Hence, user behaviour has varied during the Covid-19 pandemic. While the OLabs videos and animations explain concepts and demonstrate how to perform the experiment in the physical lab, simulations are interactive virtual experiments that could be used as substitutes for hands-on physical labs. Simulations are highly interactive, and students may repeat them in case of errors.

We observe that visitors overall have spent more time with interactive simulations than watching animations and videos. This is confirmed by the average bounce rate (12.3%), which is lower in the case of simulations with more unique page views of the simulations (3621.6), as seen in Table 2. Hence, it can be inferred that there is preference

for simulations. Nevertheless, this could also be attributed to the fact that, due to school closures during Covid-19, physical lab work was not possible, making simulations the next best choice to learn-by-doing.

Table 2. Unique pageviews and average bounce rate

Total visitors	Average of Unique Pageviews	Average of Bounce Rate
Simulations	3621.6	12.3%
Animations and Video	1915.5	14.0%

5.4 How many visitors are returning?

Another indication on the usefulness of the OLabs platform is based on type of visitors and their preference for skill certain type. Both new and returning visitors viewed more simulations when compared with animations and video, though simulations was clearly a preferred skill type by returning visitors, as seen in Figure 6 (left). As seen in Figure 6 (right), the bounce rate is seen lower for simulation when compared with animations and video and these numbers are further lower for returning visitors. This is probably an indication that both types of visitors find the learn-by-doing experience with simulations useful.
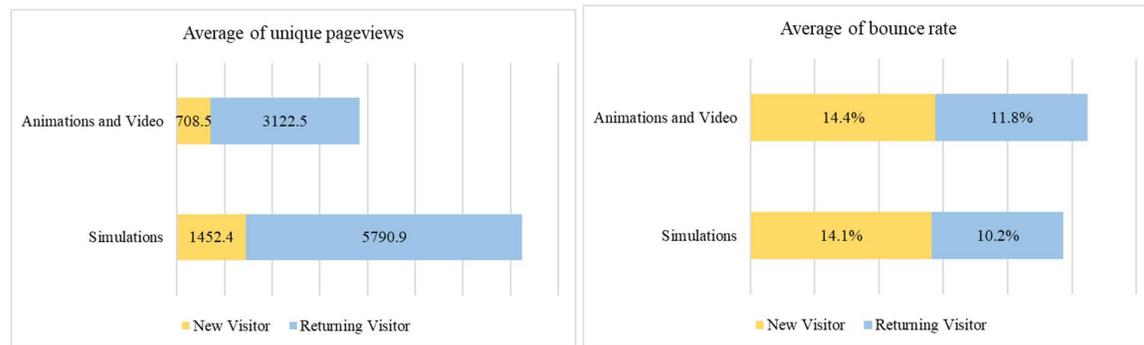
Figure 6 (Left) Unique pageviews (right) and bounce rate for simulations compared to animations and video combined.

5.5 Top skill types used by learners

When data for learners' interest in various skill types is compared, it is encouraging to see that theory has the highest average time (10m 15s) spent on a page with highest unique page views (4,823,389), as observed in Table 3. An interpretation of this result could be that the learners start with reading the theory about the experiment and, then try out doing the experiment using simulations and finally they explore other skill types like procedure, animations etc.

Table 3. Time spent, bounce rate, and unique views for various skill types.

Skill type	Avg. Time on Page	Avg. of Bounce Rate	Unique Pageviews
Theory	00:10:15	19%	4823389
Simulation	00:09:29	9%	2124868
Procedure	00:07:00	21%	1324577
Video	00:06:00	15%	473059
Viva Voce	00:04:01	21%	344163
Animation	00:03:15	11%	729666
Resources	00:02:00	14%	119087

When we compare the two years under study, we observe that the learners showed highest interest for simulations, as indicated by the average time spent on the page (9m 29s), which also has the lowest bounce rate (9%), as indicated in Figure 7. Overall, during the pandemic time, the bounce rate decreased across major skill types like simulation,

animation, theory and video, which is an indication that due to the lockdown, learners spent more time using OLabs resources.
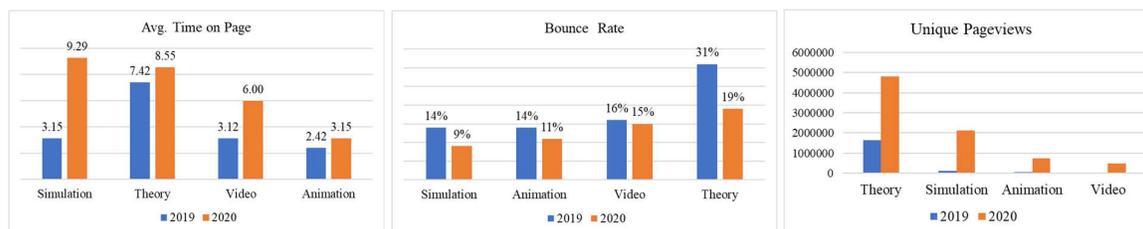
Figure 7. Comparing user's engagement based on skill type between pre-COVID and during COVID time.

5.6   Most accessed content of a subject by skill type

Analysis of usage patterns of OLabs content based on subjects reveals interesting patterns as illustrated in Figure 8. The highest unique page views were of the theory tab, comprising 48% of the total unique page views. The theory page is the default landing page for a user accessing an experiment from within the website. This was followed by the simulation tab at 23% but with a much lower bounce rate. Visits to the animation and video tabs together accounted for about 13.1% of the total views. The resources tab, which provides external material for additional information of the lab, had the lowest level of engagement. This shows that the resources were not used, suggesting that regular users may be getting most of the learning modules within OLabs.
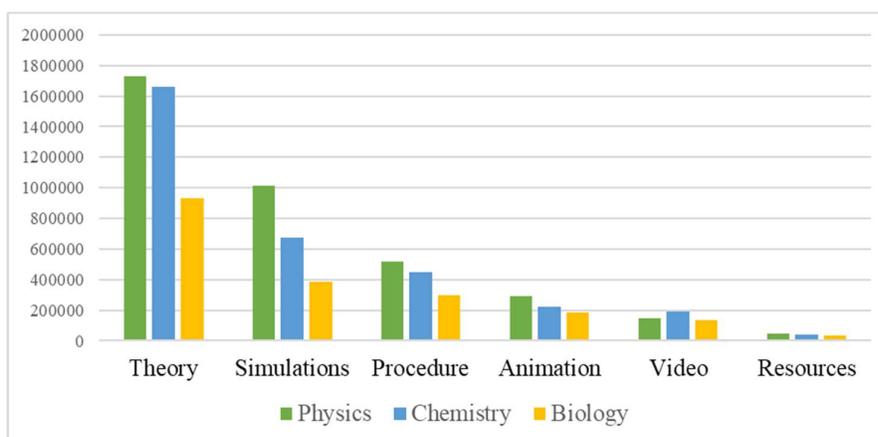

Figure 8. Unique page views of skill type based on subjects.

The rich media content consists of animations, videos, and simulations. Most animations and videos are not interactive and designed to understand the underlying concepts and techniques, while the simulations allow for online experimentation. In terms of rich media content, Physics has the highest usage in simulations compared with animations and videos put together, followed by Chemistry. In Biology, considering that many of the experiments are procedural, the simulations are used only slightly more than animations and videos.

The total page views for all rich media content, with animation, video, and simulation, is the highest for Physics, followed by Chemistry and then Biology. Students often learn from the procedure page before viewing the animations or performing the simulations. The largest ratio of unique pageviews for procedure vs. simulations and animations is in Biology, followed by Chemistry and then by Physics, suggesting that preference or need to understand the procedure before moving on to simulations and animations is highest in Biology and lowest for Physics.

Along with the increase in the number of unique page views, the average time spent on all subjects also increased during the 2020 pandemic, as observed in Figure 9. For all subjects, simulations had the greatest increase in average time spent when compared to pre- Covid-19 time, suggesting that the students were using simulations as a substitute for physical labs.
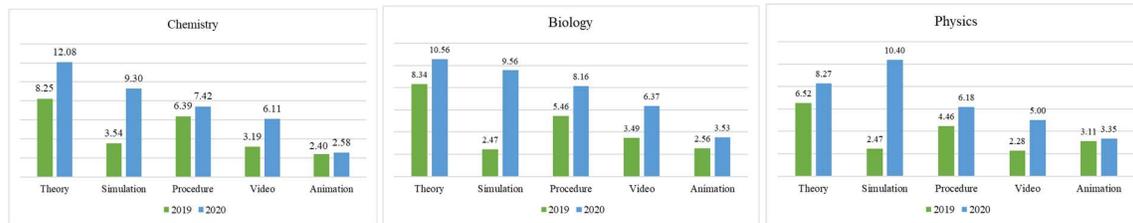
Figure 9. Comparison of average time spent on page by skill type

The procedure page provides information on using transitional school labs. Interestingly, pre- Covid-19, the page-views on the procedure and theory were much higher than on the simulation suggesting that students were learning the procedure and theory as supplementary material to prepare for traditional school labs, whereas during the Covid-19 time, the usage of the simulations is higher than the procedure and theory, suggesting that many students were using the procedure and theory pages to learn to perform simulations.
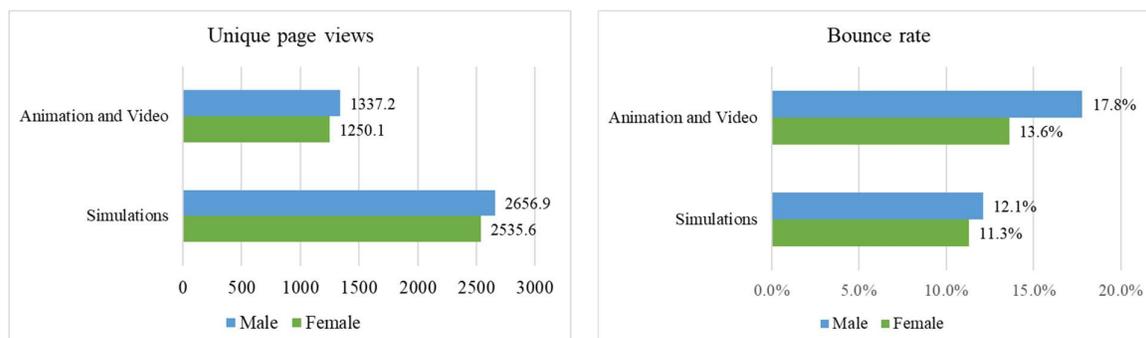
5.7 Gender analysis

Here we analyzed if gender behaved differently while accessing different skill types like animation, simulation, theory etc. In general, a slight variation in gender-based utilization of skill types can be noted, as observed in Figure 10. For example, male learners seem to slightly favour animation while female learners engage with simulations and resources. However, the variations are generally minor, and no significant gender bias is observed.
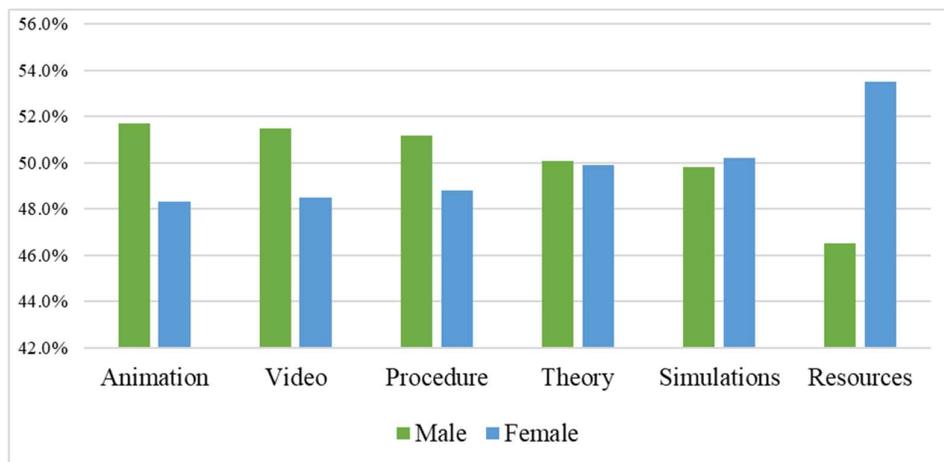
**Figure 10.** Gender preference for each skill type.

It can also be observed that between male learners had higher unique page views (2656.9) with a lower bounce rate (12.1%), for simulations, when compared with animations and video (1337.2, 17.8%), as shown in Figure 11.

Figure 11. Gender analysis based on unique page views and bounce rate for skill type.

5.8   Content accessed by device type.

Users preferred mobile devices to access content during Covid-19 time, as seen by the higher number of users and sessions from mobile devices shown in Figure 12. Overall, 65% of the users accessed the OLabs platform using mobile devices during the pandemic, which is substantially higher when compared to 41% during the pre-covid time. One reason could be due to sharing of mobile devices with learners by parents and siblings.
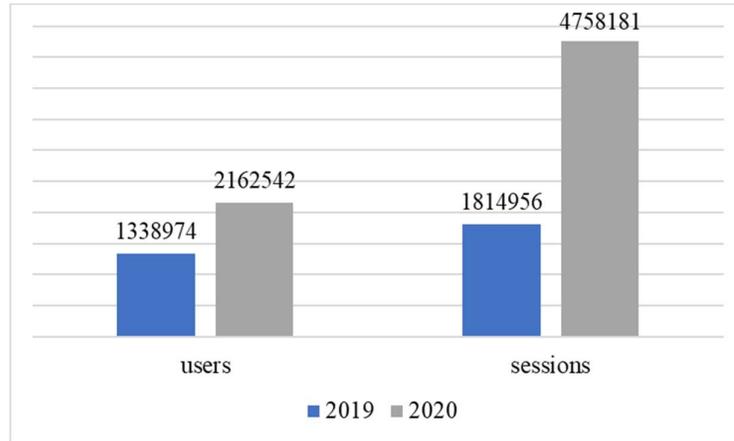
Figure 12. OLabs content accessed by mobile device.

It is however important to note that when we compare access by mobile with desktop during the pandemic, the average session duration and pages viewed per session are much higher with a low bounce rate for desktop, as seen in the Figure 13. This probably indicates learner's preference for desktop as a learning device for longer study time while mobile is used for quick access.
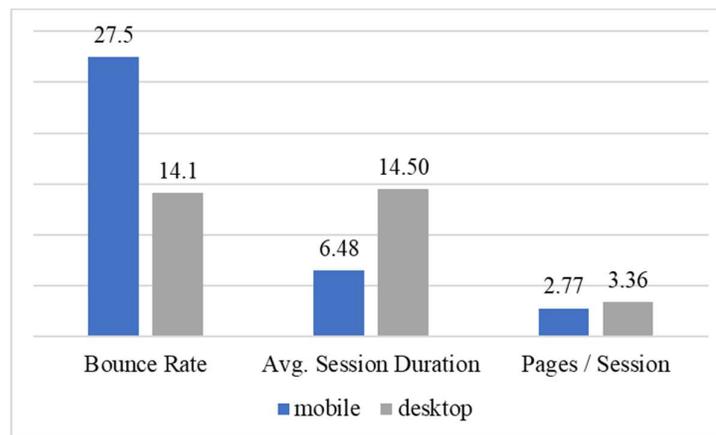
Figure 13. OLabs access comparison between mobile and desktop.

6.   Conclusions

Sophisticated virtual-learning platforms with interactivity, animations & simulations and remote-lab connections are finding increased usage during Covid-19 pandemic [18][37]. While OLabs has been used as a support tool for school education, as with many online learning platforms, its utility was increased significantly during the pandemic as laboratory experimentation in schools could not be conducted due to lockdown restrictions. School teachers are being trained to conduct experiments online using OLabs with emphasis on the teacher's role in facilitating active student engagement with the content and with each other. In line with the National Education Policy 2020 from Government

of India, OLabs will allow for all students to have equal access to quality practical and hands-on experiment-based learning experiences.

The effectiveness of the OLabs platform is best illustrated by the nature of engagement exhibited by the users. For example, the drop-in bounce rate indicates that users are wilfully using the platform for learning, not leaving after a superficial interaction. The increase in the number of pages viewed per session and an increase in session length show that users are engaging with multiple topics in the same session spending a longer time engaging in science experiments online. Since no real laboratory work was possible during the pandemic, it is likely that many schoolteachers and students utilized this platform as an alternative to laboratory experimentation. In general, the results show a greater degree of engagement and utilization of OLabs during the pandemic. This points out that online learning platforms such as OLabs are viewed as viable teaching tools by students and teachers. It also points to the fact that OLabs provides value to these users, as indicated by longer sessions and multiple page engagements.

In a country such as India with relatively high internet penetration and low access to economic resources, a free online laboratory that aids students is of great relevance. This could be part of the reason why user engagement increased during the pandemic, since OLabs is a free platform that could be accessed by students of all socioeconomic strata. Using data obtained from Google Analytics, it is safe to conclude that OLabs and such platforms have a role to play in online education. It is also likely that a portion of users who discovered these platforms due to the lockdown will continue to use them, at least as a support tool even after the pandemic subsides and normal teaching and learning resumes. Additionally, providing free access to information and scientific learning is crucial in a country such as India where students typically have access to limited resources.

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