Analysis of Barriers in Conduct of Lab Based Courses in Remote Teaching Learning Paradigm

Rupashi Behal, Saru Dhir*, Nitasha Hasteer, and K. M. Soni

***Abstract*—Many countries are implementing distance learning in response to the Covid19 pandemic. Distance learning helped learners continue their studies as schools and universities were closed due to the pandemic. The purpose of this study is to analyze the impact of Covid-19 lockdown on learners' academic performance. This research focuses on the challenges faced by distance learning learners. The purpose of this study is to identify barriers to distance learning. This study applies the DEMATEL (Decision Making Test and Evaluation Institute) approach to assess the barriers faced by learners in distance learning. The DEMATEL strategy is being used to identify the key factors by identifying the interrelationships between the various factors. A quantitative survey method using a structured questionnaire was carried out. The questionnaire was administered to a cohort of 54 undergraduate engineering students of third semester (2nd year) pursuing Bachelor of Technology (Information Technology) in India. This study found that motivation, social interaction, and resource costs were assessed in causal groups with RiCi scores of 0.332, 0.1774, and 0.113, respectively. Technical concerns and administrative issues are categorized in the effect group with Ri-Ci values of -0.333 and -0.287 respectively and are the most important criteria based on first and second highest Ri+Ci values of 0.646524 and 0.59817, respectively. Our findings reveal that motivation is the most important barrier in remote teaching learning. A sense of self-motivation can be induced by organizing workshops, practical sessions and grooming sessions. The study would benefit academic institutions and learners as it would help them to enrich the remote teaching learning process.**

***Index Terms*—Barriers, DEMATEL, online education, laboratory experiments, remote teaching-learning**

I. Introduction

Laboratory experiments facilitate learners to seek out and grasp the ideas properly. They are an integral part for science & engineering students and through the execution of these experiments, students gain expertise in sensible eventualities and acquire problem-solving skills. Analysis labs are key parts that facilitate in bridging the gap theory and follow and build a rigor for analysis and innovation amongst the students. In typical laboratories, students performed experiments, noted down the observations and prepared the reports. These practices helped them improve their experimental skills and enhance the coaching expertise of participants

Many countries have ordered the closure of instructional institutes due to the disruption caused by the Covid-19 pandemic. Most of the tutorial institutes shifted to on-line to avoid tutorial loss and guarantee continuity among the teaching-learning method. At the start of Feb 2020, faculties solely in China and a few different affected countries were closed to curb the unfold of the infection. However, by period, nearly seventy-five countries had enforced closure of instructional establishments. As of tenth March, faculties and universities were closed globally due to novel coronavirus. Roughly 264 million youngsters weren't in school [1]. Considering the pandemic, we considered redesigning the tutoring system so that it does not affect the student's career. The total education system transitioned from offline learning mode to online mode, from lecture rooms to digital platforms, and from seminars to webinars. The impact of the pandemic has brought Associate in Nursing era of technological transformation and digitalization [2].

Educational establishments in India conjointly shifted to a web teaching-learning surroundings before long once the govt. determined to pack up instructional Institutes. Although this came all of a sudden, the Institutes managed to drag off with their lecturers to the most effective of their ability and accessibility of resources. However, the foremost challenge being long-faced by the tutorial fraternity is concerning the standard of learning, which implies however well the education is being delivered and the way the content is meant. The effectiveness of learning conjointly depends on however the content is curated to the web surroundings and in understanding and addressing the constraints long-faced by students [3]. It's been prompt that innovative design-oriented laboratories ought to be developed so it becomes straightforward for learners to grasp experimental ideas clearly. This approach is required to form ideas clear, build learning straightforward, and facilitate in planning new experiments. This downside was resolved with the assistance of a virtual laboratory. Virtual labs are glorious digital resources that facilitate to save lots of prices and enhance student productivity manifolds.

A virtual laboratory is one such online platform that helps learners to conduct experiments in real environments exploitation appropriate computer-based interfaces. It helps learners to become freelance and learn at their own pace. The utilization of a virtual laboratory is taken into account economical compared to traditional laboratories thanks to the elimination of apparatus, staff, maintenance and overhead related to the standard laboratory. Theory categories area unit conducted through on-line mode and there's a challenge to conduct sensible laboratory categories. With the onset of the pandemic, tutorial activities were being conducted within the remote teaching-learning mode. Therefore, the tutorial fraternity of upper education engineering establishments and students area unit trained in a way to use virtual labs so laboratory categories may run swimmingly.

This study puts light on some of the barriers faced by the students in conduct of lab-based courses in remote teaching learning scenario. After applying DEMATEL method we analyze the cause-and-effect relationship between the barriers and identified which barrier is most important and

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need to be addresses to mitigate that barrier. We also identified the least important barrier that need not to be considered. The main objective of this analysis work is to spot the barriers faced by the learners whereas trying online sensible learning, and ultimately however we will facilitate people in their learning by understanding their obstacles and the way they'll be improved. Another objective is to understand the causative relationship between the known barriers by applying the DEMATEL (Decision Creating Trial and Analysis Laboratory) approach. Responses were collected through perception surveys throughout the lockdown period. We worked on barriers faced by the students in practical courses based on remote teaching learning which has not been adequately discussed in any of the studies in the literature.

The rest of the paper is structured as follows. Section I offers a brief introduction to the subject. Section III provides the crucial literature review. In section three the methodology used is explained. Section IV discusses the barriers to remote teaching-learning. Section V is that the DEMATEL approach that's used here to unravel the cause and result relationship among the analysis criteria. Section VI is that the formation of the causative graph that reflects the cause and result relationship between the barriers. Within the last section, the results of the study area unit are mentioned.

II. Literature Review

This section contains the findings of some of the authors regarding remote teaching-learning and the objectives of their work. Research papers and articles for the literature review are searched on Google Scholar, IEEE and Elsevier repositories.

Extant literature was reviewed to analyze the state of art and identify the gap.

Literature findings shows that study has been conducted to know graduate students' perspectives towards the use of the gamification technique such as online quiz after each test. The Data was collected via a questionnaire which was filled out by 47 graduate students. The findings from the study reveal that students have a positive perception of the use of gamification techniques in online learning [4]. In next literature review the author analyze the usage and acceptance of the 'Mobile Information System' developed and implemented by the University of Jordan, which is known as (Mobile Student Information System). For this study data were obtained from 275 undergraduate students at the University of Jordan via questionnaire to test the 'Mobile Services Acceptance Model' using Structural Equation Model. Findings also show that the context of applications is a strong motivational factor of disced ease of use and perceived usefulness, which then significantly affects user intention to use the mobile information system [5]. Another study's objective was to know teachers' and learners' perceptions towards the use of blended learning modes in teaching-learning transactions. Another motive is to find out the prospects and challenges of providing blended getting to know in a country like India. A structured questionnaire was designed in Google Forms covering the perceptions of the lecturers and novices in different Indian universities and colleges concerning online/combined services. Authors found that blended learning has the potential to be a solution for providing education in India in the 21st century [6]. In another study reported in the literature the authors focus on understanding agricultural student's perception and preference towards online learning. Students' preferences for various attributes of online classes were also explored. Data was collected through an online survey circulated among 307 students. The findings of the study shows that the majority of the respondents (70%) were ready to opt for online classes to manage the curriculum during the pandemic. The majority of the students preferred to use smartphones for online learning. Using content analysis, it was found that students prefer recorded classes with a quiz at the end of each class to improve the effectiveness of learning [7]. Another work explores the potential of remote learning, develops strategies to employ them efficiently and formulates a teaching methodology for history, enforcing competent academic delivery of the subject. The feedback of 200 students was recorded via a questionnaire. In this study authors found that the new teaching method has the potential to ease historical pressure on the subject for both faculty and students. You need to make learning fun while using visual aids effectively [8]. These studies were carried out in 2020.

Objective of another study is to investigate the extent to which students accept the use of digital tools and how suitable they find them for. Authors collected data with the help of online surveys and through a questionnaire. Authors found that the use of digital tools like LMS, video demos, webinars, mobile technologies and apps were considered motivating and useful [9]. In another work investigated by a group of researchers the objective was to investigate EdTech start-ups and the online learning boom, assess the Strengths, Weaknesses, Opportunities, and Challenges (SWOCs) of online learning in coronavirus pandemics and herbal failures, and provide some advice. And we provide recommendations. Realize an online mode to get to know each other in the course of a disaster scenario. The research tool used for analyzing the data for this study is a content analysis and the research method is descriptive research. The author found that we should have a proper mindset so that we can quickly adapt to the changes of the environment and can adjust ourselves accordingly [10]. Another study came up with the objective to study the role of virtual laboratories in laboratory skill training during the COVID pandemic and explore learners' intention on the usage of the blending learning approach. Here data was collected through a questionnaire using the Technology Acceptance Model (TAM). Authors found that there were more positive responses from users and the data showed that more than 90% of users either strongly agreed that the platform was useful in the absence of an instructor, to understand experimental concepts with minimum instructor support and visualization as a tool for understanding experimental techniques and protocols [11]. The main objective of another study is to put light on how libraries are managing to deliver access and services during Covid-19. This study found that academic library services have enhanced and strengthened the teaching and learning process [12]. Another study works on a concept to support organizational learning and knowledge transfer process within an organization, namely knowledge management (KM). This study adopts the systematic literature review

approach of 51 relevant articles. The author found that nowadays, the IT tools are rapidly changing and there are a lot of IT or KMS features for online teaching-learning to maximize knowledge transfer in times of crisis such as Covid-19 [13]. Another study focuses on the education sector and is fundamental to educational institutions due to the need to digitize the education and coaching process at record speeds with teachers who do not have the unique technical skills to teach online. It shows that we are making a change. The writer determined that online coaching has received relevance and ensured its continuance even after the Covid-19 pandemic [14]. All These studies were conducted in 2021.

Primarily the studies in literature focused on online learning scenarios and the barriers which they were facing but hardly any of these works focused on the barriers faced during practical laboratory sessions in online mode and what are the cause and effect of these barriers. Our work identifies the barriers and investigates them to establish a causal relationship.

III. Methodology

In this paper, we have used the DEMATEL approach to find the causal relationship between the identified barriers. After receiving the five criteria, a structured questionnaire was designed. In this survey, the questionnaire included a pairwise comparison of items on a five-point scale from 0 to 4, as follows (see Table I).

The survey was administered to a cohort of 54 undergraduate engineering students of third semester (2nd year) pursuing Bachelor of Technology (Information Technology) in India to know their perspective towards challenges faced in remote teaching-learning. The research instrument includes a well-designed questionnaire having 25 questions. The Delphi approach was conducted using which expert inputs were gathered to validate the questionnaire [15]. The approach was conducted in the following manner, first we identified the issue and the objective, secondly choose a group of experts and facilitator, then experts give their opinion on the questionnaire which was collected and reviewed. The pilot test was carried out to validate the semi structured questionnaire that was used later when conducting the actual survey.

TABLE I: Criterias

0	No influence
1	Low influence
2	Medium influence
3	High influence
4	Very high influence

IV. Barriers to Remote Teaching-Learning

As laboratory sensible sessions area unit completely different from theory sessions, it needs differing types of understanding of the ideas. During this topic, we've got mentioned a number of the failures or barrier factors poignant on-line sensible sessions. Covid-19's unquiet impact had crystal rectifier to a fast transformation of instruction. Fast cancellation of face-to-face learning has crystal rectifier to a complete shift within the mode of learning from offline to on-line that created a challenge for many of the scholars and lecturers [16]. To alter safe transition and bring home an eminent transformation, universities should remember of those potential obstacles and establish acceptable mechanisms to beat them (see Table I).

TABLE II: Barriers to Remote Teaching Learning

Barriers to remote teaching- learning	Description	Impact	Sources
Technical concerns	Technical glitches and interrupting network services.	Online education is more dependent upon technology therefore technical problems like network issues make it difficult for one to study online.	[14, 17]
Administrative issues	Issues in downloading and adapting to the software tools	Inadequate support to solve technical issues like downloading files and tools. In some cases, complete or proper guidelines are not provided by the teachers which lead to miscommunication and dissatisfaction.	[14, 17, 18]
Motivation	Lack of focus and self-motivation	Without a desire to succeed, students often end up doing the bare minimum amount of work in the classroom. Lack of motivation can often result in students going through the motions of learning and not retaining information.	[19]
Social Interactions	Lack of face-to-face interaction between students and teachers.	Social isolation is a common problem among the students in distant learning scenarios which makes them feel isolated.	[17–19]
Cost of resources	Non-Availability of proprietary Tools in the online platform.	Students do not have access to proper IT infrastructure and specialized tools due to high cost.	[14, 18]

The biggest challenge in adapting to online learning is the technical challenges that students and faculty usually face. Student also reports the following obstacles, as it is difficult to demand attention with an online-only smart class associate degree: boredom, loneliness, lack of time to properly perform various experiments. The professor also believes that isolation is a major obstacle to course development, seeking the optimal balance between individual student-centric learning and collaborative learning, and fostering a virtual community of applications that enhance and inspire engagement. Student collaboration between peers was pointed out [16].

Another barrier is that the fast transition from face-to-face learning to distance learning in addition desires teaching workers with various levels of readiness and data to use new techniques and utterly totally different pedagogies utilized in on-line labs to make students learning easier [17]. Not all university members are accustomed to the web environment. Ethnic differences can distinguish between those who rely on traditional methods and have never used technology tools and younger faculties who are accustomed to new technologies. Universities also are facing barriers because of the monetary

constraints and limits obligatory by IT infrastructure. Because of current unsure economic conditions, universities face a decrease in student enrollment [18].

The main issue featured by the scholars in laboratory sessions could be a lack of understanding of the experiments. One can't perceive experiments by merely observation a video unless and till they perform it on their own the fundamentals won't be clear. Very important percentages of the learners are below the non-public financial gain haven't got computers or automaton mobile phones, and so they are unable to access the virtual lab (online laboratory platform) facilities. These students are being helped by their friends or relatives having android mobile phones. Also, some of the virtual laboratory experiments don't have good content and so few students are discomfited.

V. DEMATEL METHOD

DEMATEL methodology was initially created to check the planet downside structure by analyzing scientific, political and economic issues that are influenced by various factors and sub-factors. In recent years, the first DEMATEL methodology has been wide accepted together of the best tools to unravel the cause-and-effect relationship among the analysis criteria [19]. The purpose of selecting this was its easy approach and application. It's quite correct, economical and simple to work on.

The various steps to implement DEMATEL approach are illustrated below:

Step 1: Calculate the typical matrix

Various consultants were consulted, and surveys were conducted. The assorted attributes were judged interconnected to every different and ranking as zero, 1, 2, 3, 4 were assigned with zero as no influence, one as low influence, 2 as medium influence, three as high influence and four as very high influence.

The aggregation of knowledgeable opinions ends up in the ultimate matrix :

$$Z=[Zij]n\times n \quad (1)$$

n is number of factors used in this step and also the degree to that the knowledgeable perceived clotting factor effects on factor j is denoted as *Zij*.

Step 2: Compute the normalized initial matrix D for the direct relationship

Similar to the original DEMATEL method. Based on the direct relation matrix *Z*, the normalized direct relation matrix *D* can be obtained by Eq. (2, 3). Therefore, the scalar *Y* is calculated as follows:

$$Y = 1/\max 1 \leqslant i \leqslant n \sum n\, j=1\ aij \quad (2)$$

where, $i, j = 1, 2,\ldots\ldots,n$ and, then is used to compute the normalized direct relation matrix *D* with

$$D = Z\times Y \quad (3)$$

TABLE III: AVERAGE MATRIX

	Technical concerns	Administrative issues	Motivation	Social Interactions	Cost of resources
Technical concerns	0	3	1	1	1
Administrative issues	3	0	0	0	0
Motivation	3	3	0	4	2
Social Interactions	3	1	4	0	1
Cost of resources	3	3	0	0	0

TABLE IV: NORMALIZED INITIAL DIRECT RELATION MATRIX D

	Technical concerns	Administrative issues	Motivation	Social Interactions	Cost of resources
Technical concerns	0	0.25	0.083	0.083	0.083
Administrative issues	0.25	0	0	0	0
Motivation	0.25	0.25	0	0.33	0.16
Social Interactions	0.25	0.083	0.33	0	0.083
Cost of resources	0.25	0.25	0	0	0

TABLE V: TOTAL RELATION MATRIX

	Technical concerns	Administrative issues	Motivation	Social Interactions	Cost of resources
Technical concerns	0	0.096255	0.01239	0.01239	0.011312
Administrative issues	0.07531	0	0	0	0
Motivation	0.155643	0.140698	0	0.14766	0.044913
Social Interactions	0.140736	0.033507	0.145222	0	0.017934
Cost of resources	0.094138	0.09258	0	0	0

Step 3: Compute the total relation matrix T

Once you have the normalized direct relation matrix D, you can use Eq. (4) to derive the total relation matrix *T*.

where *I* is the identity matrix $n\times n$. The elements of *tij* represent the indirect effects that factor i had on factor *j*, then matrix T reflects the total relationship between each pair of system factors.

$$T = lim\ m\to\infty\ (D1 + D2 + \cdots\cdots\cdots\cdots. + Dm)$$
$$= \sum\infty\ m=1\ Di \quad (4)$$

where, $\sum\infty\ m=1\ Di = D1 + D2 + \ldots\ldots\ldots\ldots\ldots + Dm$

$= D\ (I + D1 + D2 + \ldots\ldots\ldots\ldots\ldots + Dm\text{-}1)$

$= D\ (I - D)\text{-}1\ (I - D)(I + D1 + D2 + \ldots\ldots\ldots\ldots\ldots + Dm\text{-}1)$

$= D\ (I - D)\text{-}1\ (I - Dm)$

$T = D\,(I - D)$-1

Step 4: Calculate the sums of rows and columns of matrix T:

In the total relation matrix *T*, the total of rows and also the total of the columns are diagrammatical by vectors r and c severally as shown in formula (5) and (6). Once (r-c) is positive the criterion belongs to the cause cluster otherwise it belongs to the impact cluster.

$$r = [ri]\ n\times 1 = (\sum \boldsymbol{nj}=\mathbf{1}\ tij)nx\times 1, \quad (5)$$

$$c = [ci]\ `\ n\times 1 = (\sum \boldsymbol{nj}=\mathbf{1}\ tij)1\times n, \quad (6)$$

wherever [*Ci*] ` is denoted as transportation matrix.

Let, *RI* be the total of ith row in matrix *T*. The worth of *RI* indicates the whole given each directly and indirectly effects, that clotting factor has on the opposite factors. Let, *cj* be the total of i th column in matrix *T*. the worth of *cj* shows the whole received each, directly and indirectly, effects, that each one different factors wear factors *j*. If *j* = *I*, the worth of (*ri* + *ci*) represents the whole effects each given and received by clotting factor. In distinction, the worth of (*ri* – *ci*) shows net contribution by clotting factor on the system.

Step 5: Set the threshold (α) and create a causal plot

The threshold (α) was calculated by subdividing the elements of the matrix *T* given in Eq. (7).

$$\alpha = \sum \boldsymbol{ni} = \mathbf{1} \sum \boldsymbol{nj} = \mathbf{1}\ [\boldsymbol{tij}] / N \quad (7)$$

where *N* is the total number of elements in the matrix *T*.

The causal diagram maps the *(ri + ci, rici*) dataset to visualize the complex relationships of the and provide information to assess the impact on the most important and related factors. This can be derived through deployment and provides valuable insights for decision making. The graph shows only effects that are greater than the specified threshold.

T matrix:

Threshold value(Alpha)= 0.048827

TABLE VI: IDENTIFYING THE IDENTITY OF THE FACTORS

Ri	*Ci*	*Ri+Ci*	*Ri-Ci*	Identity
0.13234542	0.46582669	0.598172113	-0.333481273	Effect
0.075310101	0.36303924	0.438349349	-0.287729147	Effect
0.488912733	0.15761157	0.646524303	0.331301162	cause
0.337399122	0.16004908	0.497448206	0.177350037	cause
0.186717232	0.07415801	0.260875242	0.112559222	cause

TABLE VII: T MATRIX

	Technical concerns	Administrative issues	Motivation	Social Interaction	Cost of resources
Technical concerns	0	**0.096255**	0.01239	0.01239	0.011312
Administrative issues	**0.07531**	0	0	0	0
Motivation	**0.155643**	**0.140698**	0	**0.14766**	0.044913
Social Interactions	**0.140736**	0.033507	**0.14522**	0	0.017934
Cost of resources	**0.094138**	**0.09258**	0	0	0

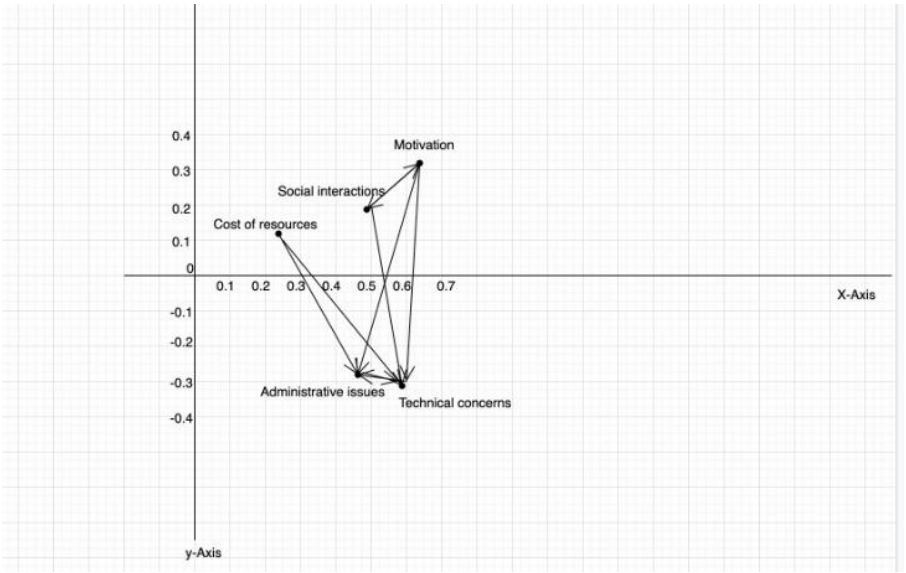

Fig. 1. Causal graph.

VI. FORMATION OF THE CAUSAL GRAPH

In Fig. 1, graph represents the cause-and-effect relationship between the barriers and found that motivation, social interaction, and resource costs with *Ri-Ci* scores of 0.332, 0.1774, and 0.113, respectively are categorized in cause group. Technical concerns and administrative issues are categorized in effect group with *Ri-Ci* scores -0.333 and -0.287 respectively.

VII. Results and Discussion

The current research study finds different barriers to remote teaching learning that the learners are facing during the pandemic. Factors having positive values of (*Ri-Ci*) have a greater influence on one another and are assumed to have higher priority others with negative values of (*Ri-Ci*) receiving more influence from another are assumed to have lower priority. On the other hand, the value of (*Ri+Ci*) indicates the degree of relation between each factor with others, and factors with more values of (*Ri+Ci*) have more relationships with others. Those having little values of (*Ri+Ci*) have less relationship with others. If the value of (*Ri-Ci*) is the positive or net cause, such dimensions are classified in the cause group, and the highest (*Ri-Ci*) factors also had the greatest direct impact on the others. In this study, motivation, social interactions and cost of resources are classified in the cause group having the *Ri-Ci* values of 0.332, 0.1774 and 0.113 respectively. If the value of (*Ri-Ci*) is negative, such dimensions are classified in the effect group, and largely influenced by the others. For this study, technical concerns and administrative issues are categorized in the effect group with *Ri-Ci* values of -0.333 and -0.287 respectively.

This study also reveals that motivation and technical concerns are the most important criteria based on first and second highest *Ri+Ci* values of 0.646524 and 0.59817, respectively.

Our findings reveal that motivation, social interactions and cost of resources, are the three barriers which have greater influence on one another. On the other hand, administrative issues and technical concerns are the barriers which are largely influenced by the other factors. The study infers that motivation is most important barrier in remote teaching learning. Students don't feel self-motivated while they are learning online. One can't feel motivated by just simply sitting at home and learning online. Self-motivation comes from within when you are adapted to the learning environment or when you are performing experiments on your own and learning more new things while you are in college or school. It is therefore important to induce an attitude of self-motivation amongst the learners. Second most important barrier is technical concerns. This barrier is very common as it has been observed the students are unable to attend online classes properly due to internet issues and they face problems in downloading files and study materials as well. This barrier can be mitigated if organizations and individuals invest in resources. Therefore, resource upgradation can be a solution. Then we have cost of resources which is the least important barrier. The cost of resources is currently the least significant obstacle to address as generally college-bound students own devices such as mobile phones and laptops for studying.

Literature findings reveal that pandemic may have an impact on the enrollment of learners for a new academic year [19]. The main barriers to remote teaching learning have been technical infrastructure, competences and pedagogies for distance learning and the requirements of specific fields of study. A study reported in the literature has deployed DEMETAL reveals that IT Experts and Technical Competence of e-learner staffs were the two most important barriers [20]. The challenges being brought out by our study are motivation, social interaction, technical concerns, administrative issues and resource costs. The study infers that motivation, social interaction, and resource costs are categorized in cause group and technical concerns and administrative issues in the effect group. The study found that motivation and technical concerns are the two most important barriers.

VIII. Conclusion

For the development of a nation and growth of its citizens, it is of prime importance to keep education sector a priority. The education sector should be improved consistently to make progress in long term. Education sector needs improvement and enablers to make it resilient and sustainable during emergencies. The study would help academicians and practitioners to further act upon to improve the parameters to mitigate the barriers and make the most of remote teaching learning paradigm for learners.

The study's outcome is that the authors were able to categorize the barriers into cause and effect and able to identify the barriers which are of prime importance. In this study the represented model reveals the cause-effect relationship among the identified barriers. The study reveals that motivation, social interactions and cost of resources are classified in the cause group and technical concerns and administrative issues are categorized in the effect group. The recent pandemic of covid-19 impacted the education sector the most. The study has analyzed the barriers to successful conduct of practical based courses during remote teaching learning.

The study examined the perception of the undergraduate engineering students and identified the barriers faced by them in online practical lab-based courses. The study concluded that Motivation and Technical concerns are the most important barriers which are needed to be worked upon. Least important barrier found out is cost of resources. Hence, we can say that the biggest barriers between online practical learning and the students are lack of self-motivation and technical problems faced by the students such as internet issues. A sense of self-motivation can be induced with the participation in workshops and conducting grooming sessions. Technical concerns such as internet issues can be mitigated by resource upgradation and IT infrastructure investment.

Conflict of Interest

The authors declare no conflict of interest

Author Contributions

Rupashi Behal did the formation of research instrument, data collection and literature analysis. Saru Dhir has contributed to methodology along with Nitasha Hasteer. Saru Dhir is the corresponding author for the study. K.M. Soni did the result analysis of paper. All authors read and agreed on the final work.

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