

Post-COVID-19 era: An Enabler for the Implementation of Blended Learning in Compliance With the NEP 2020

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Abstract

Government of India has cleared the New Education Policy (NEP) 2020 by bringing out many reforms in the education sector with a focus on education design, delivery, and assessment. This work is an attempt toward perceiving the post-COVID-19 era as an enabler in the engineering education process for the implementation of blended learning. Causal analysis through the Ishikawa diagram is brainstormed for enlisting all the potential causal factors for the inability to restore normalcy during the COVID-19 pandemic. Process Failure Modes and Effects Analysis (PFMEA) is adopted for restoring normalcy through prioritized corrective actions. Thus, NEP 2020 is considered for leveraging blended learning.

Keywords

blended learning, COVID-19, PFMEA, Ishikawa diagram, NEP 2020

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Introduction

Adhering to systems and processes has always been the top priority at the GMR Institute of Technology of India. All the stakeholders possess a sense of ownership toward the institute, thus promoting the brand image of the institute which requires no separate advertising strategy. Being the number 1 clean and smart campus in India (2019 census) has not been an easy achievement. Academics along with co-curricular and extracurricular activities are followed for the all-round development of the students. Things were in smooth succession, but then, all of a sudden the COVID-19 appeared. This led to an essential social lockdown worldwide, which plunged the whole education system into darkness. But the world did not stop there. Thanks to the technology and the world switched to online pedagogy.

There were many questions that surfaced regarding online course coverage, online examinations, evaluation, and mode of content delivery. Faculty had to come out of the clutches of traditional education model and had to embrace the new online mode of education. Gadgets like smartphones became the lifeline for the learners. Optimal usage of the phone memory data became need of the hour. Students had to make some strong decisions on the usage of smartphone memory within their limited available budget. And this started the new “online” learning in all fields of life ranging from household cookery classes to the technology-based engineering education (Senthil Kumaran & Periakaruppan, 2022).

Understanding NEP 2020 and its Salient Features

New Education Policy (NEP) 2020 focuses on value-based education which revives back the rich Indian traditional education system comprising holistic development of the student leading to a knowledge-based society (Patil & Patil, 2021). NEP 2020 proposes that a common regulating authority named Higher Education Commission of India (HECI) would be formed that governs functioning of both the public and private higher education (HE) institutions. NEP 2020 focuses on strengthening Central Advisory Board of Education (CABE) (Menon, 2020). Student who enters HE can have several entries and exit choices in degree courses. It also intends to universalize, access to school education from pre-primary to secondary level with 100% Gross Enrollment Ratio (GER) in school education by 2030 and proposes strong foundation for literacy and numeracy for all.

It is reported that the NEP 2020 enables *atmanirbhar* (self-reliance) of the Indian Schools (Haragopal, 2020) with the holistic development of the student as it focuses on strengthening the multidisciplinary courses and facilitates them to study courses of their choice. Courses related to music, instruments, art, and vocational courses will gain more prominence according to this new policy of NEP 2020. It is highlighted that the key issues for successful execution of NEP include addressing the aspects like necessity of vast resources, discrepancies between available expertise and existing jobs, integrity among all streams of education, and digital divide. It was also

emphasized that entire anticipated outcomes or end results of NEP policy rely on its effective implementation by initiating coordination among education, skill development, and labor ministries (Govinda, 2020). A way forward for successful implementation of NEP 2020 includes rigorous contemplative properties like merging, multidisciplinary, flexibility, autonomy, greater emphasis on research and innovation that are widely accepted by the teaching fraternity globally. Collaboration between State and Central Government plays a vital role in real outcome of this entire process implementation.

Bringing the innovation parameter at HE level is the key for its quality assurance as this drives the economy in this knowledge era. To supplement this, it is stressed that there are numerous pathbreaking endorsements to promote cost-effective HE to the last mile in NEP 2020 that help create a significant mass of intellectuals and researchers who can contribute to the global knowledge pool. It is emphasized that stakeholders' perception in understanding the spirit of NEP plays a vital role in the fulfillment of the policy to a greater extent at the root level. In addition, education institutes must be proactive to implement numerous measures of NEP with the main aim of Right-To-Education to all the sections of the society (Batra, 2020). As a result, India can emerge as a knowledge superpower (Khushnam, 2022) to cater the needs of global community in the near future.

Blended Learning and COVID-19

Blended learning is defined as the thoughtful combination of both face to face, as well as, online learning. Rasheed et al. (Rasheed, Kamsin, & Abdullah, 2020) performed a literature survey for identifying the challenges faced from the viewpoint of students, teachers, and management, in the online aspect of blended learning. Students had to face self-regulation challenges like postponement, time management, peer-learning strategies, and preparation before the class. Faculty had the challenge to adapt to the technology involved in communicating via the new online platforms. They also had to face certain operational challenges like troubleshooting technical problems, creating synchronization between online and offline modes. The challenges faced by the management included provision of online learning technologies at an affordable cost, training and retaining faculty, and recruitment of electronic technicians for proper maintenance and repair of electronic devices and related software. Above all, the main challenge was to maintain students' motivational levels persistently throughout the course delivery in the online mode. Predictors of students' learning performance in blended learning mainly constitute clarity in goals, expectations, quality of learning material, and collaborative learning (Vo et al., 2020).

A major hindrance to online component of blended learning is about the inequitable student access to the online resources (Code et al., 2020). Not all students are economically sound and can afford a desktop, laptop, smartphones, or any other internet-based gadget. In such a situation, the effectiveness of online component of pedagogy remains questioned. Student belonging to geographically rural areas face the obstacle of a

deteriorated internet connectivity. Students of this domain have rated low about the online learning and strongly voted that the online learning is not interesting (Suryaman & Mubarak, 2020) mainly due to interrupted internet connectivity leading to loss of concentration and interest.

The students of the present era have grown up surrounded by technological gadgets like the smartphones and internet-enabled mobile devices. Prior to COVID-19, these electronic and internet-enabled gadgets were looked as a luxury for the students, whereas in the present era of this pandemic, they have become more of a necessity rather than a luxury. Hence, one has to be in line and updated with this dynamic changing reality. So, one has to listen to the voice of the present generation and talk from their perspective, that is, in the internet enables online world. Therefore, blending the traditional face-to-face learning with the online component is the necessity of the hour (Ożadowicz, 2020). Thus, the effective way of promoting blended learning is to formally include it in the curriculum of HE institutes during and after COVID-19, as promoted by the Vietnamese Government (Pham & Ho, 2020).

The strategies for promoting blended learning mainly involve prior high-quality preparation by the faculty, extending support to the faculty for collaboration with one another, and bringing the faculty learning opportunities in line with the current needs (Darling-Hammond & Hyler, 2020). Discover, Learn, Practice, Collaborate and Assess (DLCPA) is five strata blended learning strategy deployed successfully during the COVID-19 pandemic (Lapitan Jr et al., 2021). DLPCA consists of both asynchronous learning using pre-recorded videos, as well as synchronous component of live exchange of knowledge. This strategy can be adopted for online, flipped, or hybrid sessions. Thus, blending the traditional learning with online component is the call of the hour amidst COVID-19 pandemic (Daminda Kuruppu, 2021).

Research Objective

COVID-19 pandemic is viewed as an enabler for the implementation of blended learning in compliance with NEP 2020. On an optimistic note, the hibernation period of social lockdown during the COVID-19 pandemic served as a springboard for all students, faculty as well as parents to make a comeback as a better version of themselves and face the future with confidence. COVID-19 became the root cause for educators to accept blended learning. The objective of this work is to propose the restoration of normalcy through blended learning which is outlined in NEP 2020 in India.

Research Methodology

Process capability is the concept employed in the manufacturing domain for assessing the potential and performance of the manufacturing process to produce a quality product (Sharma et al., 2016, 2021). The same concepts of manufacturing process capability have been adopted for horizontal deployment in the education process at GMR Institute of Technology in India.

Cause-and-Effect Analysis

Ishikawa diagram forms the basic tool to brainstorm the potential causal factors for the students-staff problems in the technical education sector (Shinde et al., 2018). Figure 1 reflects the cause-and-effect diagram (Ishikawa diagram) for restoring normalcy through blended learning in engineering education. The cause-and-effect diagram (also known as Ishikawa diagram) is a scientific tool for brainstorming and enlisting all the potential causes for the end effect of process deviation under consideration.

As indicated in Figure 1, the end effect of process deviation under consideration is “Restoring normalcy through blended learning in engineering education”. Contributions from all the stakeholders of the education process, viz., students, faculty, parents, management, and supporting staff are taken into consideration while formulating the Ishikawa diagram. Under these categories of the stakeholders, the potential causes for the end effect are brainstormed and are arranged in the Ishikawa diagram. The following is the categorization of the cause and effect:

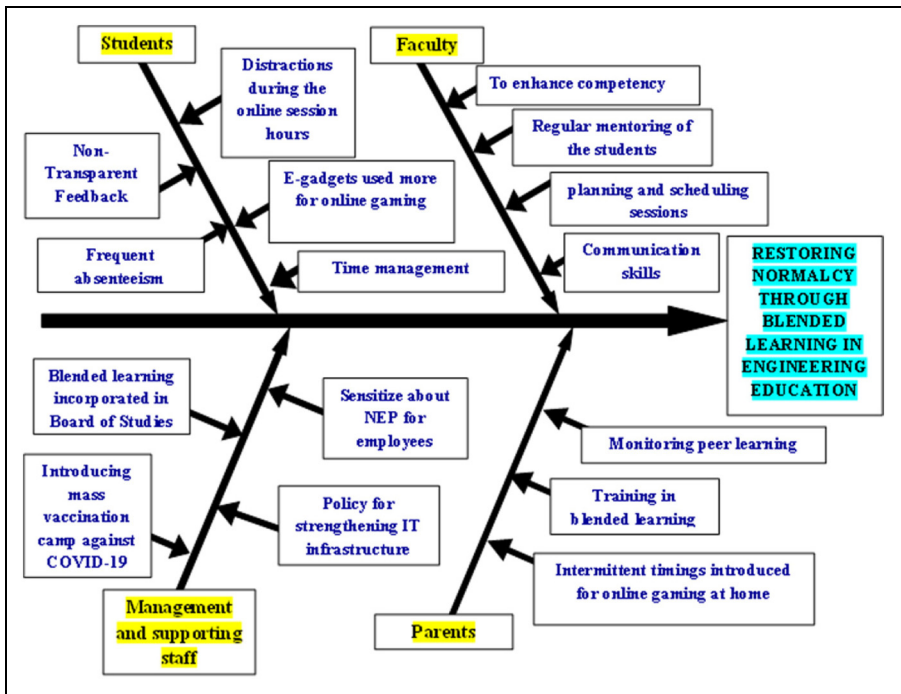


Figure 1. Cause-and-effect (Ishikawa) diagram for restoring normalcy through blended learning in engineering education.

- Category 1: Faculty: The potential enlisted causes under this category are to enhance competency, regular mentoring of students, planning and scheduling sessions, and communication skills of faculty.
- Category 2: Students: The potential enlisted causes under this category are distractions during the online session hours, E-gadgets used for the purpose other than studies like online gaming, ineffective time management, nontransparent feedback, and frequent absenteeism during the learning sessions.
- Category 3: Management and supporting staff: The potential enlisted causes under this category are to sensitize about NEP for employees, policy strengthening for IT infrastructure, blended learning, and adopting mass vaccination against COVID-19 to restore normalcy.
- Category 4: Parents: The potential enlisted causes under this category are to monitor peer learning about their wards at home, imparting training for parents in blended learning, and allowing children for fixed intermittent timings for online gaming at home.

The general rule in establishing the cause-and-effect diagram is that the direction of all the main and sub arrows in the diagram are directed as a single flow toward the central main end effect under the study (in this case it is about restoring normalcy through blended learning in engineering education).

Process Failure Modes and Effects Analysis

As a part of establishing the process capability, the Process Failure Modes and Effects Analysis (PFMEA) constitutes an important aspect for outlining and prioritizing the corrective actions (Sharma & Rao, 2014). The PFMEA is extensively used in the product manufacturing sector for analyzing the effects and causal factors for the potential failure modes of the product manufacturing process (Sharma et al., 2018). The same concepts of PFMEA are horizontally deployed to the service sector (Sharma et al., 2021). Table 1 outlines the PFMEA in the educational environment at GMR Institute of Technology.

The explanation about the PFMEA in Table 1 is as follows. First, in Table 1, “restoring normalcy through blended learning in engineering education post-COVID-19 pandemic”, is recognized as the process under observation intended for attaining improvement. For this targeted process, six potential failure modes are identified. Failure modes are defined as the different manners in which the failure of the identified process happens. The identified failure modes of the process are, first, that blended learning not happening; second, blended learning not happening effectively, third, practical learning sessions not happening. No coordination between the departments is the fourth identified potential failure mode, fifth one is that the peer learning not happening and lastly the sixth potential failure mode is about the incorrect usage of electronic gadgets for gaming instead of knowledge gaining.

Table 1. Process Failure Modes and Effects Analysis (PFMEA) in Blended Learning at GMR Institute of Technology.

Process	Potential Failure Mode	Potential Effects	Sev.	Potential Cause	Occ.	Current Controls	Det.	RPN
Restoring normalcy through blended learning in engineering education post-COVID-19 pandemic	Blended learning not happening	Incomplete learning	9	Policy of blended learning not in place	9	Blended learning incorporated into Board of Studies	9	729
		Lack of interest in student	8	Lack of interest in student	8	Regular mentoring of the students	5	360
	Blended learning not happening effectively	NEP vision not achieved completely	9	NEP awareness not there	4	Conduct of NEP sensitization program	5	180
		Ineffective learning	7	Stakeholders are new to Blended Learning System	7	Sensitization and training program to all stakeholders	5	245
	Practical learning sessions not happening	Kinesthetic learning and HOT skills not achieved	9	Student unable to understand and comprehend- A change in teaching methodology required	7	Regular student feedback policy	4	196
				No machinery and equipment for conducting experiments & practicals	2	Fund allocation for purchase of machinery	2	36
		Student unable to attend or faculty	6	Vaccination plan for	7	378		

(Continued)

Table 1. Continued

Process	Potential Failure Mode	Potential Effects	Sev.	Potential Cause	Occ.	Current Controls	Det.	RPN
				unable to conduct because of ill-health due to COVID-19		the students and faculty		
		Maker education not happening	7	No practical learning	2	Allocate time slots for practical-based project works	2	28
	No coordination between the departments	Chaos and confusion prevails and incorrect decision making	7	An Integrated Learning Management System not present	3	Policy framing for strengthening IT infrastructure	2	42
	Peer learning not happening	No exchange of Knowledge	7	No contact and networking among students	1	Conduct of online seminars among the peers for better exchange of knowledge	2	14
	Incorrect usage of electronic gadgets for gaming instead of knowledge gaining	Student gaining psychomotor skills through online gaming but lagging behind in technical knowledge gaining	9	Excess freedom and access to usage of electronic gadgets	9	Differential Time slots catered for online gaming and online learning	8	648

Note: NEP = New Education Policy; RPN = Risk Priority Number.

For each identified potential failure mode, the immediate, as well as the long-term potential effects, are brainstormed and enlisted. For each potential effect, a “severity” ranking is allotted on a scale of 1–10, where rank 1 is least severe and rank 10 is the most severe. Next to this in the PFMEA process is to chart the potential causal factors for the failure modes obtained through the Ishikawa diagram. Even here, a ranking is given for each causal factor, depending of the frequency of the history of the occurrence of the causal factor. Ranking is given from 1 to 10, where 1 is allotted to the least occurrence and rank 10 is allocated to the most occurrence of that particular causal factor.

The next phase in the PFMEA process is to elaborate on the “current controls” over the causal factors enlisted in the previous step. The “current controls” describe about the extent of influence of the system to control the occurrence of the identified causal factors. Each enlisted “current control” is allotted a detection ranking between 1 and 10. Here, the detection rank 1 signifies easy detection and rank 10 is about difficult to detect the current control. It is emphasized here that the value of the “ranking” for severity, occurrence, and detection is governed by the expertise of the cross-function team of the PFMEA document.

The next phase in the PFMEA is to calculate the “Risk Priority Number” or the “RPN” in abbreviation. The RPN is obtained by multiplying the corresponding rankings of the Severity, Occurrence, and Detection values which are previously elaborated. Each RPN value is taken as the measure for prioritizing the corrective action required for the corresponding causal factor.

Corrective Actions

The largest RPN obtained through PFMEA in Table 1 is addressed first for taking the corrective action, followed by the descending order of the RPN values. Thus, finally, the value of RPN is the scale for prioritizing the corrective action to be taken for the identified failure modes. Table 2 shows the final corrective actions for the RPN (Risk Priority Number) in the priority of descending order starting with the highest RPN obtained in Table 1.

In Table 2, it can be clearly observed that the highest RPN value of Table 1, is 729 which is for the potential cause of “Policy of blended learning not in place” and the least RPN value is 14 which is for the causal factor of “No contact and networking among students”. Accordingly, the major corrective action deployed is about making blended learning as an integrated part of the Board of Studies which is of prime concern emerging from this scientific methodology of Failure Modes and Effects Analysis in the educational service sector scenario.

Discussion and way Forward

The National Education Policy (NEP 2020) has been introduced by the Government of India to revive back the education sector in India. NEP 2020 was approved on

Table 2. Corrective Actions for the Risk Priority Number (RPN) in the Priority of Descending Order Starting With the Highest RPN.

S. No.	RPN	Corrective Action
1	729	Blended Learning as an integrated part of Board of Studies
2	648	In order to attract the continuous attention of the student in online sessions, frequent intermittent breaks at regular intervals consisting of short online gaming were introduced. This shall retain the interest of the student in online studies and minimize the absenteeism rate.
3	378	Mass vaccination camps organized in consultation with the government authorities.
4	360	Trained mentors and psychologists employed in regular roll list of the Institute
5	245	Training in blended learning extended to all the stakeholders in phase wise manner
6	196	Student feedback taken at regular intervals regarding the teaching-learning process
7	180	NEP sensitization program conducted for all employees including the supporting staff
8	42	Robust IT infrastructure strengthening policy put in place
9	36	Funds allocated in the Annual Operating Plan for procurement of new essential machinery and equipment
10	28	Allocation of time slots for practical-based project works
11	14	Conduct of online seminars among the peers for better exchange of knowledge

Note: NEP = New Education Policy.

July 29, 2020 by the Union Cabinet of India, which is in the era of COVID-19 pandemic. The term “blended course” makes its appearance in NEP 2020, offering special training to the educators to cater the needs of children with disabilities. The blended mode of delivery is proposed to be a choice for imparting training in the B.Ed. courses and shall be preferred for Open Distance Learning programs. It is confirmed in NEP 2020 that blended and online mode of delivery shall be imparted for adult education. Also, NEP 2020 reaffirms that the HE institutes may blend the online NPTEL-based courses with traditional teaching. It is also confirmed that blending of the online education must be with experiential and activity-based learning in order to leverage social affective and psychomotor dimensions of learning.

Thus, a substantial portion has been catered to the blended learning approach in the NEP 2020, not only for HE but also for special education for children with disabilities, adult education, teacher training, and all the areas where there is a possibility to connect traditional pedagogy with online mode of instruction delivery. This makes NEP 2020 as the correct platform to leverage blended learning in India during the trying times of COVID-19.

In this work, the industrial engineering troubleshooting principles like the cause-and-effect analysis and the PFMEA analysis are employed for restoring normalcy through blended learning in engineering education post-COVID-19 pandemic.

Potential causes for the deviations are enlisted and corrective actions are prioritized and implemented in the educational sector scenario. This makes this work unique in itself as it is a novel attempt for employing the industrial engineering principles of the manufacturing sector for the improvement of educational service sector.

Conclusion

At the outset, this work is a reflection of the future of engineering education. “COVID-19” is the word that sends shivers through the spine. If we turn and look back into the year 2020, it has been a dark period in the recent human history that witnessed a setback in almost all walks of life including education. All the expectations at the beginning of the New Year 2020 got vanished in just a couple of months disappointing every individual and pushing everyone to face the outbreak of COVID-19 global pandemic, which has affected the lives and livelihoods across the globe. This leads to a huge market recession impacting the global economy. Education sector is no exemption from being disrupted.

Blended learning approach is proposed for the present generation of students involving a large number of students who are comfortable with the new age online and internet-based mode of studies. Focus must be set on Higher-Order-Thinking skills of Revised Blooms Taxonomy (RBT), wherein the learner is exposed to the pragmatic and kinesthetic way of lifelong learning. This prepares the students to solve the real-life problems and ultimately to lead a successful life with a genuine purpose for the society.

NEP 2020 provides a generous space for promoting blended learning in the pedagogy. PFMEA has been performed at the GMR Institute of Technology in India and the corrective actions have been prioritized in the descending order of the RPN. Thus, an attempt has been made in this work for proposing solutions for restoring normalcy to the problems posed by the COVID-19 pandemic by employing the industrial engineering principles of cause-and-effect analysis and the PFMEA through blended learning mode of delivery considering NEP 2020 as the leveraging platform.



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