

Moving An Institute Online - Challenges and Experiences

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Abstract

This paper covers issues in moving an Institute of 10,000 students and faculty online and managing the services. Here are some of the processes and innovations we set up to achieve this:

- Laptops and internet connections were arranged for needy students through Alumni donations.
- A Help Desk operated from 800am to 1200 midnight. The highest call load was observed at the beginning of the semester and during exams. Typical problems were ‘password not working’ and ‘not able to take the exam due to connection problems’.
- Faculty were trained on pedagogical issues in online teaching, and best practices
- on How to engage students in live lectures, especially for large classes that needed attention
- LMS enhancements and integration with video conferencing platforms enabled automatic attendance marking for live lectures.
- Assessments posed issues. Student bandwidth would be erratic, creating problems while submitting the answer scripts. Platform logs were analyzed to check if the complaint was genuine (due to bandwidth) or spurious.
- Cheating during exams: Apart from proctored platforms like ProctorU and Codetrantra, innovations like using Zoom simultaneously with the LMS were tried. Low value and continuous evaluation seem to reduce cheating.
- Differently abled persons needed special attention

1. Introduction

With the closures brought about by the COVID 19 pandemic in March 2020, IIT Kanpur, a premier technical institute in India, needed immediate solutions to teach hundreds of courses to close to ten-thousand students. Teaching moved online and technology needed to be put in place quickly. The uncertainty of the duration added to the challenge, and the various stakeholders like teachers, students and administrators needed to adapt quickly and adopt new practices to meet the situation. This paper describes the challenges and the solutions in the process of taking IIT Kanpur online.

1.1 Immediate response to pandemic and lockdown

With only about one month left between the beginning of lockdown in India in March 2020 and the end semester exams in April 2020, the institute administration decided to promote all the students while leaving the option of conducting the exams to the instructors. There was an immediate need for an online platform to carry on teaching the remaining course content and conduct the final exams.

IIT Kanpur has experimented with flipped classrooms since 2016 and has offered several courses using the onlinecourses portal[1]. With a readily available platform, about 42 instructors decided to conduct the final exams and upload some course content.

1.2 Search for solutions

Although a few faculty were able to complete teaching for the remainder of the semester and conduct exams, the institute needed technological solutions and new processes to outlast the pandemic starting with the Fall 2020 semester. The administration began looking at the popular Learning Management Systems like Canvas, Blackboard, etc., to deliver lectures in multiple formats, make announcements, conduct several types of assessments, engage in discussion formats, etc.

And they decided to officially go with the homegrown platform mooKIT while giving freedom to the instructors to use a platform of their own choice. mooKIT [2], a MOOC management system, was enhanced and modified into a Learning Management System hosting the IIT Kanpur online course portal HelloIITK[3].

1.3 A brief introduction to mooKIT

mooKIT is a MOOC management system developed in 2015 at IIT Kanpur, using open source technologies. The existing MOOC platforms like Coursera, edX, etc., targeted tech-savvy users. At the same time, the open-sourced MOOC management systems like open-edX etc. were sophisticated software systems and tended to cater to a larger audience.

With a clear need insight, mooKIT was designed and built with the following design principles in mind:

- the platform must be easy and intuitive to use
- course management must be simple
- should not demand technical maturity from users
- should be efficient with server resources
- should be built using open-source technologies

1.3.1 Features of mooKIT

- **Scalability:** mooKIT is designed to scale by shifting most business logic to the client-side, thus freeing the server resources. This architectural decision gives the server the ability to handle multiple users simultaneously.
- **Analytics:** mooKIT has a state-of-art analytics module, which provides a comprehensive analysis of student activities. It provides an easy-to-use analytics dashboard, which gives insights about the course as a whole and at an individual level.
- **Interactions:** mooKIT can be integrated with popular social platforms like Facebook and Twitter. The forums and hangouts on the platform can be used by the students to interact with each other. Using audio forums, users can express thoughts and ideas using audio mode rather than type.
- **Certifications:** Certificates for students can be automatically generated using templates based on the criteria set by instructors.
- **Blockchain-based credentials:** Tamper-proof, independently verifiable certificates issued on the Bitcoin blockchain
- **Progressive mobile applications:** mooKIT has mobile apps for iOS and Android platforms. The course content is cached locally, thus making it available even when the device is offline.

Until March 2020, mooKIT was used to offer more than 60 courses and to reach 200000+ students from all over the world.

1.3.2 Changing mooKIT to Hello IITK

mooKIT, being primarily designed to be a MOOC management system, differs from traditional Learning management systems in significant ways. Some of the differences are highlighted below

- **Content centric vs class centric approach:** a MOOC management system organises a course around its content, whereas an LMS tends to organise a course around the traditional classroom model.
- **Emphasis on assessments:** Assessments, both formative and summative, are quite important in a traditional classroom setting, whereas in a MOOC, the primary emphasis is on learning
- **Open vs closed:** MOOCs are open to a wider audience, whereas LMS serves only a set of registered students within a university.
- **Integration with existing infrastructure:** A LMS needs to be integrated with an institution's IT infrastructure, whereas a MOOC management system has no such integrations defined.

After identifying such differences, we made the following major changes to HelloIITK.

- **Integration with institute LDAP Server:** To restrict the access only to personnel associated with the institute and to reuse their existing institute credentials without creating new accounts, we integrated mooKIT with the institute's LDAP servers
- **New types of assessments:** Descriptive questions with the ability to type an answer in addition to multiple-choice and short answer questions were added. Timed quizzes and assignments were created. Additional configurable time option was also given for DAP students.
- **Content bubble:** In all the MOOCs offered on mooKIT, video lectures are uploaded to YouTube, and the player is integrated to take advantage of YouTube's familiarity with the end-users. However, since the content created for the institute LMS is copyrighted and the faculty may not want it to be put out in the open, we created a YouTube-like service internally using AWS ElementalMedia Services. All the uploaded videos are transcoded into three lower resolutions to ease the bandwidth consumption.
- **CI/CD for mobile apps:** For urgent bug fixes and feature updates, waiting for App Store and Play store can have negative consequences. App updates are pushed dynamically and instantly using Ionic Appflow.
- **Forum notifications:** To encourage more participation in the discussion forums, email notifications were sent to students' email addresses whenever a new forum was created or a follow-up discussion was made. This was done by integrating with the institute's SMTP servers.
- **Platform level messaging:** To facilitate messages from the administration to different stakeholders like students and faculty, platform level messaging was created with several aliases. Messages were sent as emails to everyone in an alias.
- **Integration with Zoom:** The institute purchased hundreds of Zoom licenses to carry out office hours. Zoom was integrated with HelloIITK so that meetings could be launched from the portal, and faculty could take attendance from the platform itself.

A more detailed description of the issues and challenges of this change can be seen at [4].

2. Pre-semester start preparations

With the worsening pandemic, many students needed to leave the hostels without knowing when they are coming back, and the institute did not know what the future was going to be like either. Given this, one needed to do a lot of background work to enable the students for an online engagement.

2.1 Identification of students

With the students spread across every corner of the country and many international students across the border, the challenge was to reach 10000+ students with various connectivity and access issues. The administration sent out survey forms asking students about their whereabouts, internet connection types, contact points, etc. A portal, accessible internally, was made using the collected information, with options to filter students according to their year of enrollment, department of study, network status, etc. A bird's eye view of their approximate locations is shown below and is drawn using integrated Google Maps API, with the ability to identify individual students and contact them if needed.

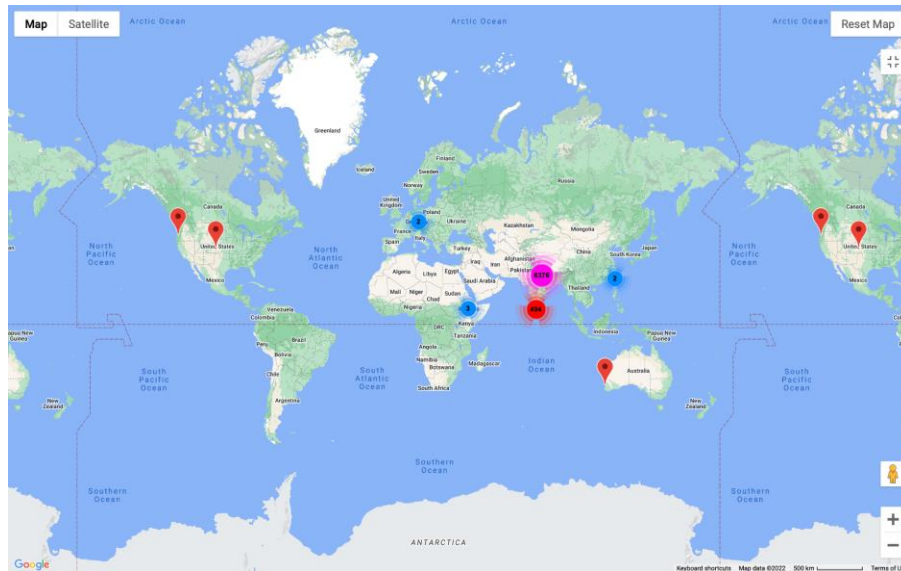


Fig 1: Clusterview of students across the world



Fig 2: Clusterview of students across India.

2.2 Providing laptops to students

It turned out that several students did not have adequate access devices or internet connections. With the help of the alumni association, the institute raised about INR 30 million to purchase laptops for 600 financially challenged students so that they could carry on their education digitally.

2.3 Sensitizing the faculty to online teaching

With the help of experts from various institutes in India, including IIT Kanpur, the institute arranged a series[5] of lectures for the faculty to help create better online teaching materials. To help the faculty, a website[6] laying out the guidelines for video lectures was also developed.

The table below gives the number of courses that went online using the HelloIITK portal. Some faculty, to the tune of 20%, did not use the HelloIITK portal but used other services like Canvas, moodle etc., since they are already familiar with those platforms.

Session/Semester	Start date	Courses
2020-21, Sem-I	Sept 1, 2020	386
2020-21, Sem-II	Jan 13, 2021	328
2020-21 Summer	June 07, 2021	42
2021-22, Sem-I	Aug 2, 2021	351
2021-22, Sem-II	Jan 5, 2022	481
Total courses		1,588

Table 1. A semester-wise list of courses added to the HelloIITK portal

2.4 Help Desk

To deal with queries from faculty and students and deal with day-to-day operations, a help desk consisting of five members was established. The members of the Help Desk needed to understand how to operate the platform and become proficient in recognising mistakes that users are likely to make.

2.5 Faculty Training

Training sessions were conducted for the faculty, in small groups, to familiarize them with the platform and its features. Features and platform-specific processes were clearly explained along with demonstrations. Test courses were created to play with the features and understand the platform and processes fully.

2.6 Training sessions for Teaching Assistants(TA) and Tutors

Training sessions were also conducted for TAs and tutors to familiarize them with their roles like grading assignments, dealing with add/drops, etc.

3. Post-semester-start challenges and solutions

3.1 Role of the help desk

As soon as the semester began, the help desk was bombarded with queries from faculty and students alike. The team handled queries through four lines of phone calls and emails. Most of the queries from faculties were about uploading materials and conducting assessments. Students' queries were on issues with login and submitting assessments. Apart from the online FAQs, the Help Desk also gave demos to individual users as and when required.

Help Desk also worked apace with other institute facilities and helped with onboarding instructors and students. They also created courses on the portal and mapped students and instructors to the courses.

Queries handled

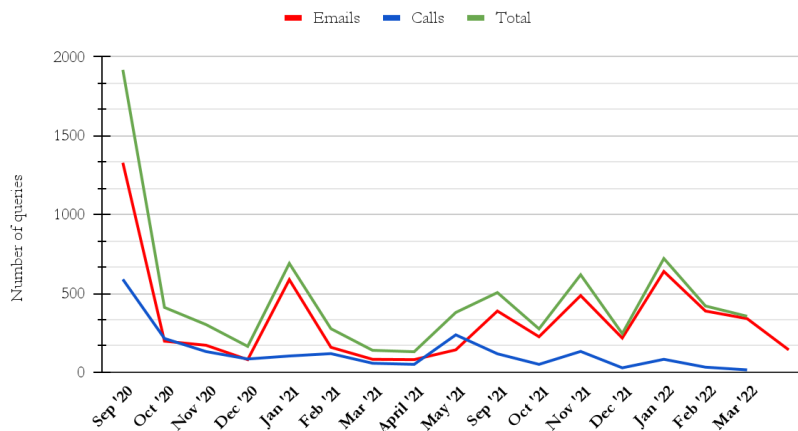


Fig 3. Queries handled by the help desk

As seen in the graph, queries tend to be higher at the beginning of a semester and gradually taper down. Queries at the beginning of the semester are typically about course enrollments and issues with access to courses. There were only a few queries between June '21 and August '21 as not many courses were running during the summer semester and because of the second wave of the pandemic in India.

3.2 Changes to the platform

3.2.1 Changes in Assessments

Many students have faced issues while submitting the assessments and uploading files at the last minute. Due to network delays, the requests wouldn't reach the server on time, and the files and the student responses were lost.

To handle such scenarios, a grace period of 10 minutes was given for assessments with file upload type questions, and a grace period of 2 minutes was given for other assessment types at the platform level. Their final submission time was visible to the instructors, and they had the flexibility to either accept it as a late submission or not.

3.3 Changes to pedagogy

To conduct office hours, the institute purchased several Zoom licenses for the Faculty and Teaching Assistants. The HelloIITK portal is integrated with Zoom to facilitate scheduling and announcing office hours with ease.

Apart from the office hours, the faculty preferred live lectures over zoom to pre-recorded lectures. The recordings of such lectures were then uploaded to the HelloIITK portal, which can be viewed by the students on-demand.

With the integration of the platform with Zoom, the attendance of all the participants in an office hour or a live lecture was automatically captured and kept available in the portal.

3.4 Issues with assessments - cheating

The assessments module on the portal has been continually improved to let the faculty conduct short quizzes, assignments and exams with minimal interferences.

The platform provides various important features such as the ability for instructors to upload answer sheets/assignments on behalf of students, downloading answer sheets for grading, uploading/downloading question papers and solution files, importing marks of quizzes conducted outside of the platform etc.

3.4.1 Using logs to refute false claims during assessments:

Every click on the student interface is logged in detail to the server. We collect details such as user id, device type, IP address, page URL, timestamp etc., periodically to ensure that we do not miss any response registered by the student.

The team has been successfully able to validate the following type of claims using this information on the logs:

- Many students raise false claims regarding attending /submitting a particular quiz/exam. These can be validated by looking at the log snapshot against the quiz duration. It can be easily determined whether the particular student has accessed/attempted the quiz.
- In many instances, we were able to successfully catch students attempting quizzes using another student's credentials by correlating the IP addresses and student details registered on the logs.
- Student requests for late submissions claiming network connectivity issues during the assessment. These claims can also be validated as we log activities from the student interface every 10 seconds.
- Claims regarding missing file uploads, wrong files, answers not being registered etc. The logs can be used to determine whether the student uploaded any files or registered any answers during the assessment or not.
- We have successfully prevented scripted attacks on the portal to gain access to question file(s). The team was able to catch the students responsible using the details on the logs.

The team has successfully provided any additional details and log snapshots as and when requested by the faculty members.

4. Accommodating DAP students

Online courses have posed special challenges for students who are differently abled. Learning management systems need to support special features to support Differently Abled Persons (DAP). And the processes need to be changed to accommodate their special needs. Here are some of the innovative process steps we used to enable DAP students

- Extra time (normally 33%) is automatically given to every DAP student in an exam. While the platform does this automatically, the Instructor needs to be alerted that there are such students in the class and be alert to submissions coming late.
- Exams were conducted orally whenever feasible.
- The status of a student (DAP or not) is flagged by the Dean at the time of admission to the Institute and is automatically applied to all Courses the student registers in.
- Help Desk alerts all Instructors where the DAP students registered.
- Special training sessions are conducted for DAP students.

5. Conclusions

The lockdown and consequent moving to a fully online mode has necessitated many innovations. In this paper, we discussed the processes we came up with to move IIT Kanpur to remote learning. The feedback that has been collected indicates that the platforms and the process have worked very well. The Institute is now running in a fully Face-to-face mode but the HelloIITK portal is still being used by the faculty to distribute course material and conduct exams. The Institute has decided to keep these processes and technologies in place to go along with the regular classroom setting, a major approval of the effort.

References

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