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mooKIT – A MOOC Platform for Developing Countries

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Abstract
IIT Kanpur and Commonwealth of Learning (COL) have been working on Massive Open Online Courses since 2012. During this collaboration we developed a MOOC Management system and delivered close to 30 courses to about 200 000 users, in over 100 countries. Our understanding of what features a MOOC Management System should have and how to engage the students in a course has also evolved. In this paper we describe our experiences and trace how some of our software features have evolved. One of the core features is the development and integration of an advanced analytics module. We also discuss how to reduce dropouts from an open online course, a common concern for all MOOCs.

Keywords: MOOCs, Analytics, Developing Countries.

Introduction

IIT Kanpur ran its first MOOC in late 2012, a course on Architecting Software for the Cloud [1]. This was run on a customized Sakai platform[2], a well-known open source learning management system. The course was intended for advanced software developers in the industry and had close to a thousand registrations, a sizable number for such a specialized course. Sakai was adequate for the course but had several issues. For one, it required advanced Java Skills, large amount of computing power and was designed with a Classroom -based delivery in mind. We realised that there are no MOOC management systems available in the 'market' for the kind of contexts most

academic institutions in the developing countries are placed in, and decided to develop one, ground up. Commonwealth of Learning joined us 2013 in creating the requirements and specifications and in running courses. Subsequently, we developed mooKIT and ran 20 courses. See [3,4,5] for a sample. We also adopted mooKIT for running flipped classes at IIT Kanpur [6]

Our understanding of what a MOOC management system should look like, what should be its principle features and what are the limitations from a student perspective evolved over the last 4 years. These are primarily perspectives from a developing country, but many of them are applicable for a global audience as well. We also developed some insights on how to keep the students engaged and increase retention rates. In the first part of the paper we talk about platform experiences and in the second part we discuss best practices.

mooKIT Platform: design responses to challenges faced in developing countries

From our deployment in 2014, we collected data on the access to courses by learners in diverse situations, and made a number of changes to address some of the challenges identified.

Bandwidth: One of the first things we noticed we noticed is that a large number of students have a very poor or unstable bandwidth. We needed to come up with application level features that would help the students in such scenarios.

1. We built a *bandwidth indicator* of the Internet connection quite like the signal strength bars on a cell phone. This gives a visual indication to the student: if the connection was going bad, the videos would not be able to stream, thus allowing the learner to explore other content delivery options(see below).
2. Content Delivery Options:

***Audio streaming*:** The bandwidth required to stream audio is much less (For example, one can stream standard quality audio at 64kbps whereas we need at least 400 kbps for 360p (640x360) video. Many MOOC lectures are what we call 'talking head videos' - the Instructor is speaking and there are a set of slides. mooKIT has a feature where the slides and the audio are stored separately on the server. When the connection bandwidth drops below acceptable video streaming levels, the user can opt to listen to the talk and stream the audio only. The system will download the slides and play the audio in a synchronised manner giving an almost video-streamed lecture experience at much less bandwidth.

***Semi offline*:** We discovered that sometimes streaming options are not good enough to stream even the audio. Further, some of the lectures are not in the slides +audio format. mooKIT has an option where the videos can be loaded on an SD Card, which can then be loaded on the users mobile phone. The mooKIT app will stream the videos from the card. For information that is changing, like the Forum posts,

Announcements etc. an Internet connection is needed. Since these are text-only content, they work with much lower bandwidth requirements. The analytics information, like the number of views by a user are collected by the app and sent to the Instructor, thus validating the participation of the student in the course. The app does opportunistic syncing - that the analytics go the server whenever a connection becomes available. The SD card can be replicated locally and distributed to any number of users.

***Fully offline*:** mooKIT based courses can be distributed on an SD Card to be pursued without any Internet connection. Typical scenarios are archival for self-reference after doing a course, or for distribution of Open Educational Resources, which are structured as a course.

***Replicated mooKIT*:**

Social Network Connect: Forums are the counterparts for classroom discussion. The students not get to clear their doubts but also learn from questions asked by other students. Even more important than that, students often answer the questions by others, thereby gaining in confidence and engagement, building social connects and improving the overall enthusiasm in the course. However, we noticed that there is a small speed bump for this. To participate in the forum, the student has to log into the course. And normally she does it when the new lecture is released. And may not login till the next significant event, like another lecture release or some activity in the Forum post she is following.This may reduce the opportunity to participate in the Forum on a more continuous basis. We realised that many students however are active on Social Networking platforms like Facebook and Twitter. We built a feature in mooKIT where a post in the Forums can appear automatically as a post in a Facebook page corresponding to the course. And any responses to that post (on the Facebook page) will be reflected in the Forum posts in the platform. Thus, a student can follow and participate in the discussions without having to login into the course platform. A sample from a course on Integrated Pest Management is shown below [Fig 1]:

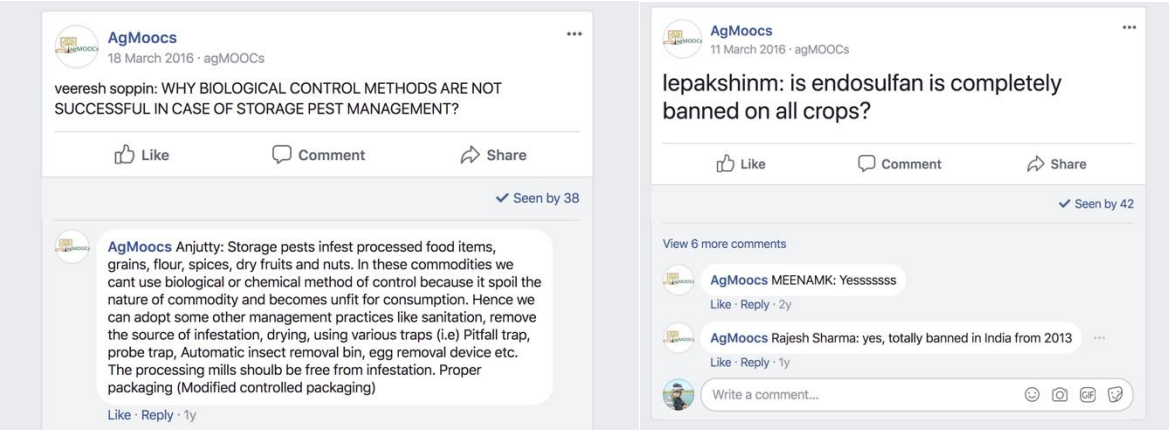

Figure 1: Integration of Social Media posts in the Forum

Analytics

mooKIT has an easy and intuitive module dedicated to monitor the student participation. The analysis is classified into 3 categories based on the phases involved during the course.

a. *Registration:* The data collected during the registration results in various insights which the Instructor can use for planning the course. It can be used to check the profile of the registered students. One gets an insight on day-to-day registrations, worldwide distribution of the audience and more.
b. *Interactions:* After registration, students go through the content, participate in discussions and share thoughts etc. An aggregate analysis of the activities of students during interaction gives an understanding about their behavior like how frequently they login, interact in forums and much more.
c. *Evaluation:* Students get certified on the basis of their performance in the assessments. An analysis on the performance would help in figuring out how well the content was received by the students, difficulty level of the questions and to identify dropouts etc.

For each of these phases a set of graphs are presented for easy understanding of the data. To collect the data, mooKIT tracks each and every click made by the user.The data set consists of the user ID, the click time, type of request, URL of the resource, IP address from which the request was made, etc.

Registration

When students register, some personal information is collected for Identity Management. Typically, apart from the information like name and email, details such as the age group that the student belongs to, their qualifications, organizational affiliation, location etc are collected.

Daily Registrations

Here we display the number of users registered on each day [Fig 2] and on a cumulative basis [Fig 3]. This may help in planning the publicity for the course.

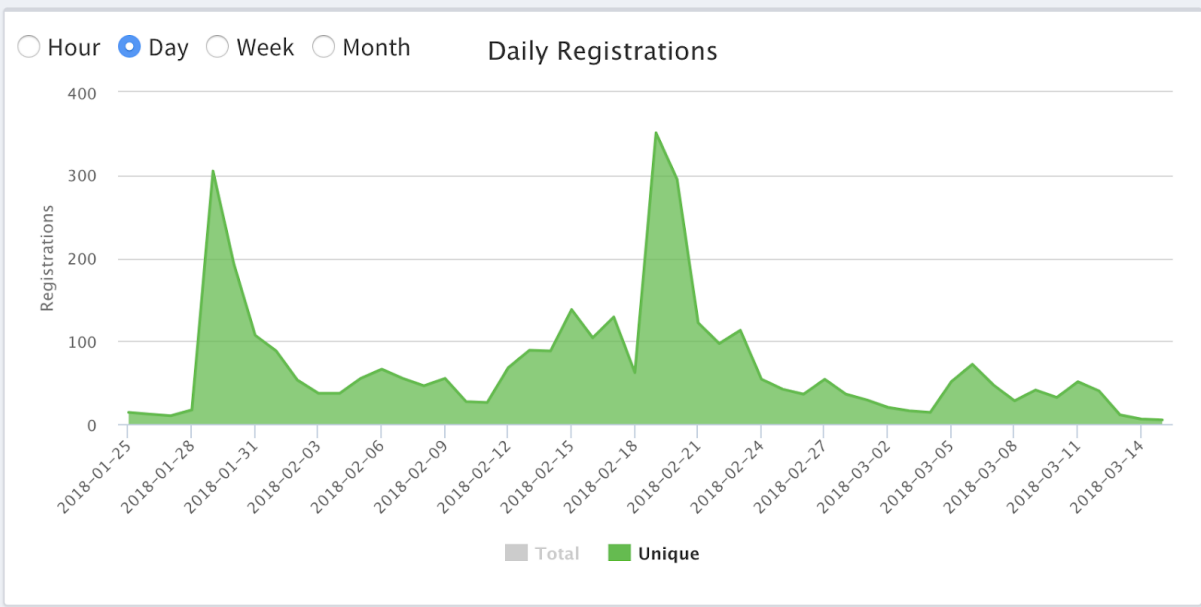

Figure 2: Daily registrations of users

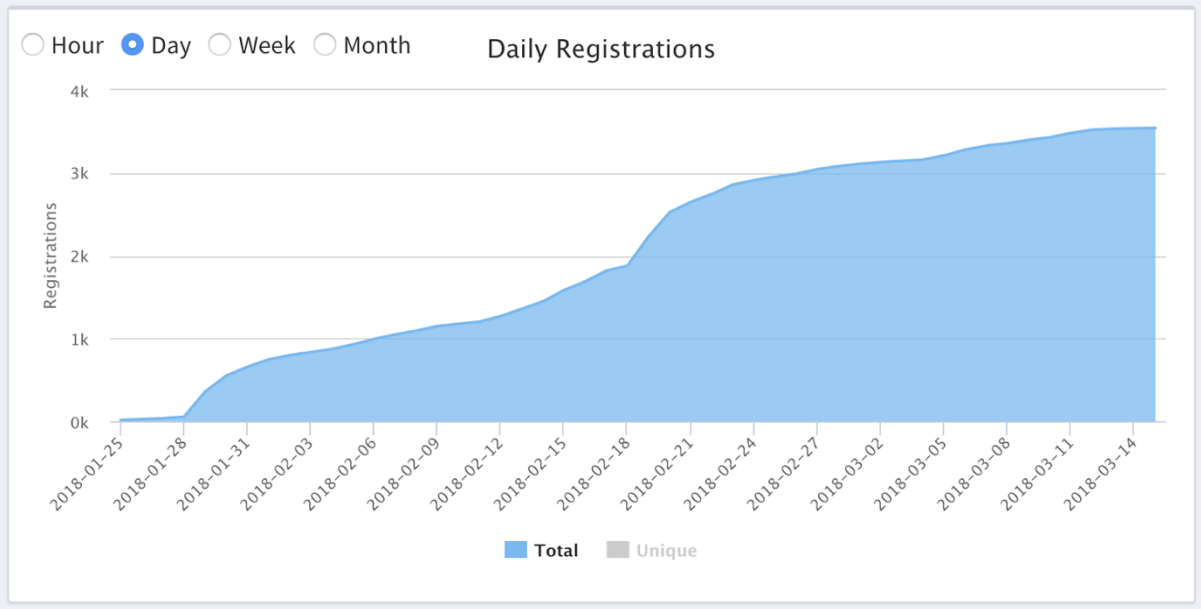

Figure 3: Cumulative registrations

Geographical Reach

We keep note of the location from which users are coming to the course. This data can be very useful to the Instructor and the program managers. The display below [Fig. 4] shows a sample distribution of a course in agriculture.

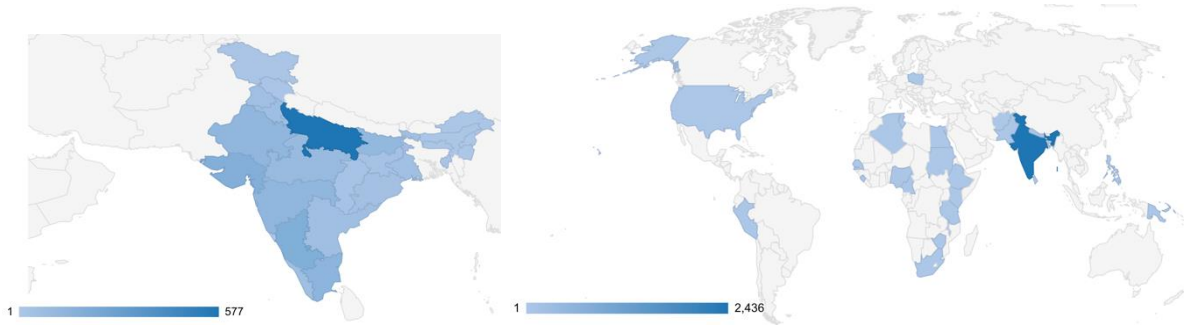

Figure 4: Geographic reach

Other Information

In Figure 5 one can see the other information like the gender, age group, qualification and affiliation depicted as pie charts. Such information is valuable also to orient the content and is particularly useful in mentoring processes.

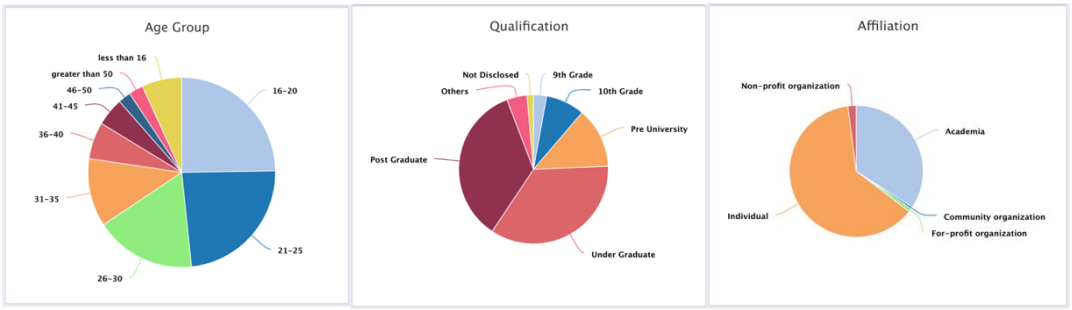

Figure 5: Gender, age group, qualifications data

Interactions

When student's login into the platform, they watch a video, participate in a discussion or simply browse etc. These activities are shown as charts in the Interactions subgroup of mooKIT analytics.

Daily Engagement Summary

As a course administrator or an instructor, one will be interested in knowing "How many students are active on each day?", "Did they view a lecture or participate in a discussion?" and so on. Also one can correlate the activity of students with a "Deadline for an assessment", an "Announcement which is sent", the "Lecture release schedule", the "Day/Time when the instructors are active in discussions" etc.

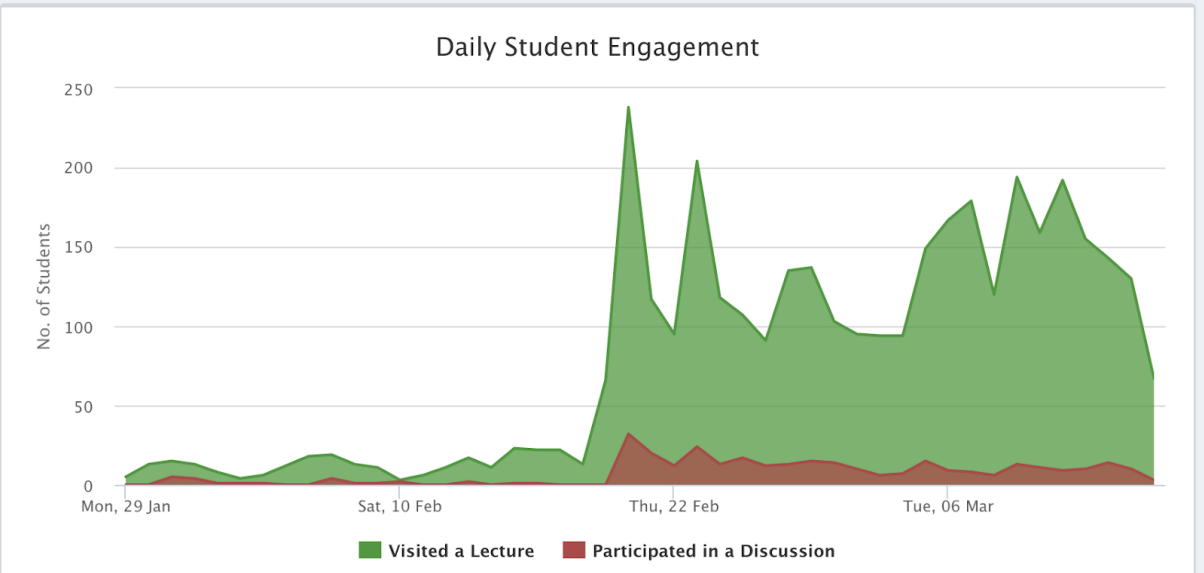

Figure 6: Daily interactions chart

Learner's activity

The Instructor will be able to see every individual students engagement with the course. We track how many times a student has visited a page, how many videos she has viewed completely and so on. A sample of this information is given below.

Show 50 entries Search: Copy Excel PDF Print

	Name	Email	Visits	Views	Quiz 1
3215	TAJ BAKI	[redacted]	19	19	70
3216	TAKHELMAYUM MALEMNGANBI	[redacted]	15		80
3217	TALIM	[redacted]			
3218	TAMAL CHATTERJEE	[redacted]	25	25	85
3219	TAMAL ROY	[redacted]	2		
3220	TAMBALA NAGESWARAIAH	[redacted]	22	18	85

Fig.7. Individual Statistics

Forum Analysis

We track the interactions that happen in Forums. That is who is answering whose questions, who are the most active people etc. This can be represented as a graph

with nodes standing for the person and a line between nodes 'a' and 'b' when 'a' answers a question posted by 'b'. A sample of this graph is shown below

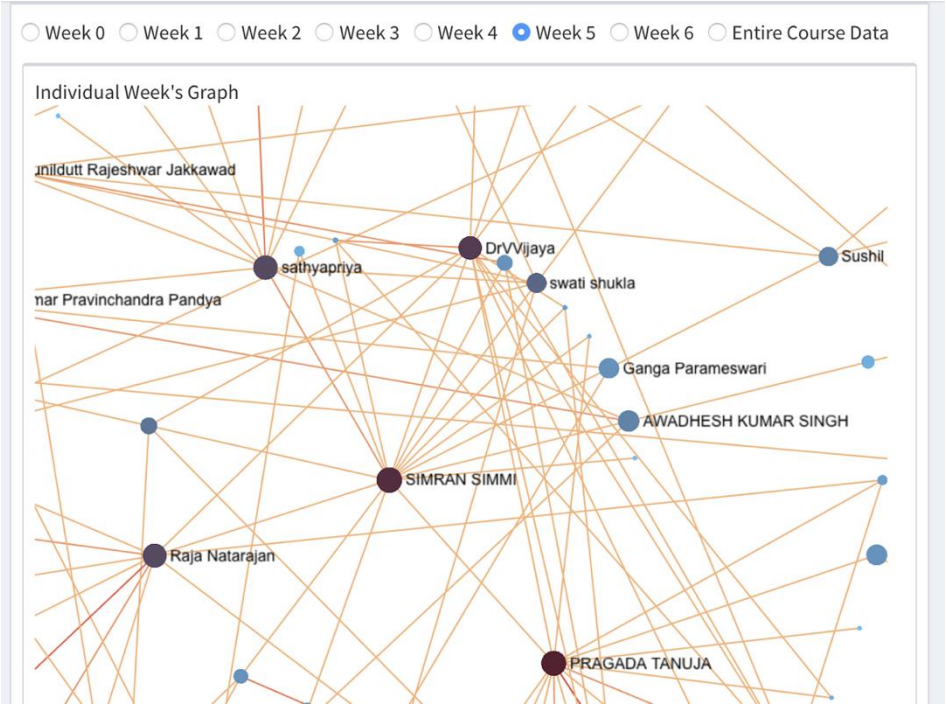

Fig 8: Interaction Network

Individual Progress Report

We provide each individual student a dashboard to keep track of her progress. This gives information about how many videos have been watched, how many are pending etc. A screen capture given below gives an example.

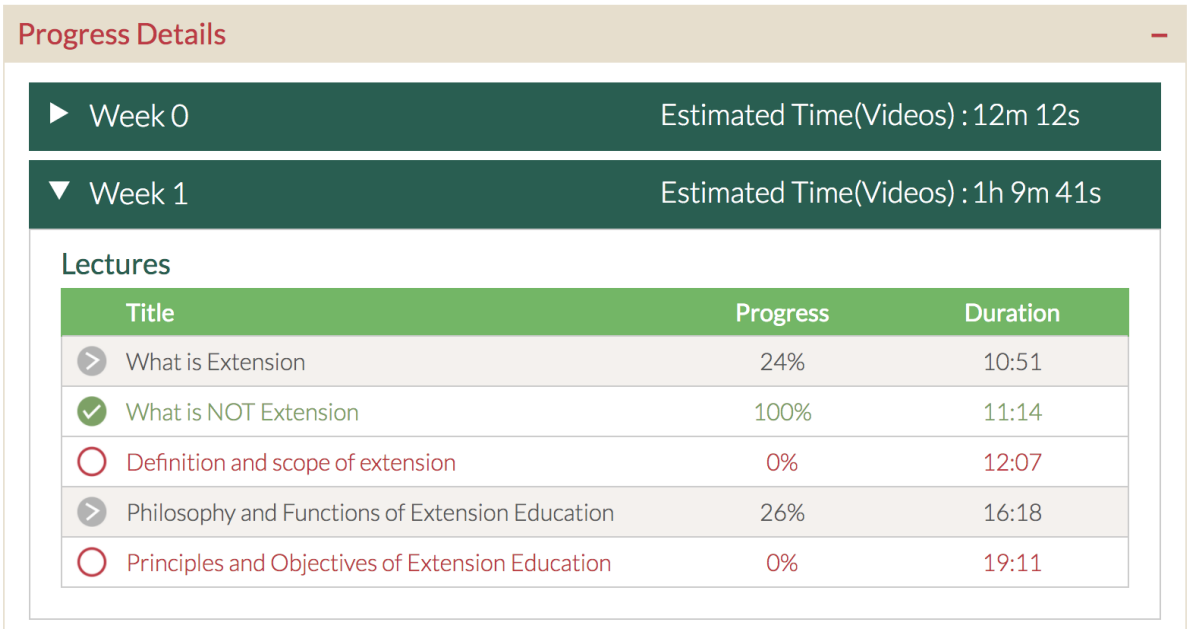

Fig. 9: Individual Students Dashboard

Architecture and Implementation

Mookit is built on open source technologies. The major driving principle is that it should be easy to scale. The state of art architecture tries to fully use the client side computing power to achieve this. The diagram below (Figure 10) illustrates the various components and services of mookit.

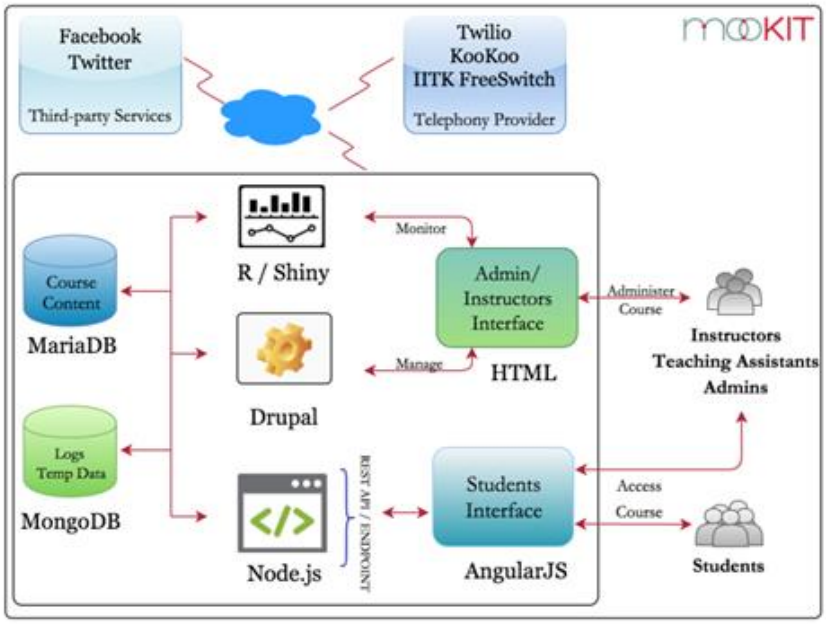

Fig.10. mooKIT Architecture

The analytics module runs as a service and communicates with all the courses running on mooKIT. Periodically the data for each course is fetched, cleaned, and stored in the local storage after partial processing. MongoDB is used for local storage for faster reads and writes. Whenever an Instructor interacts with the Analytics module, the data is fetched from local storage, processed and displayed.

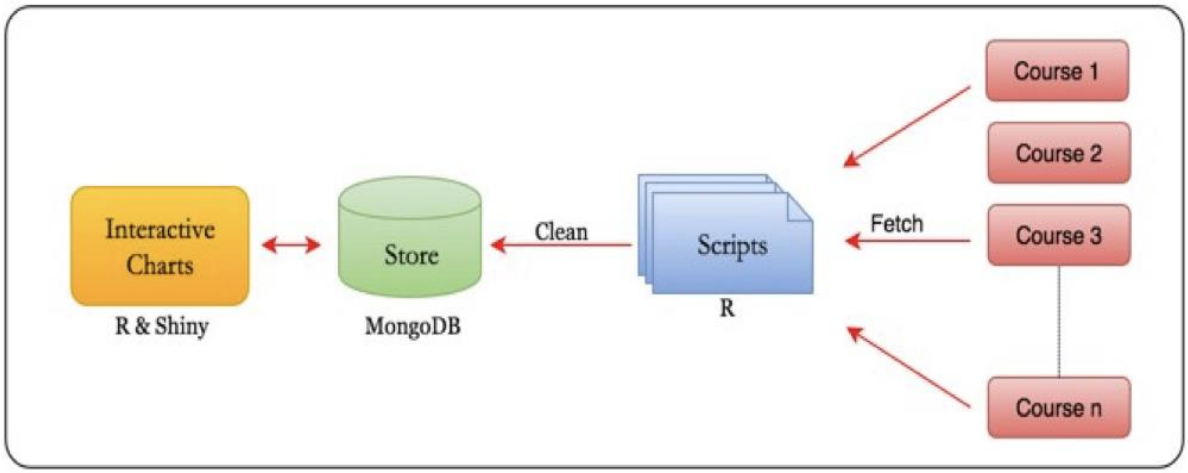

Fig.11. Analytics Processing

Best Practices

We ran about twenty courses on the mooKIT platform varying from ***Mobiles for Development*** to ***Physics of Semiconductors.*** We also are running a series of courses on agriculture[4].

In this section we will present the best some of the practices we found will help in increasing the engagement and retention of students in online courses.

Instructor Should participate:

Typically, in an online course, the questions posed by the students get tacked by the Teaching Assistants. However, we observed that if the Instructors answers the questions herself, the student engagement increases. The Instructor could also participate in the forums by posing additional questions and giving some titbits in the Forums. This increases the enthusiasm of the students and helps in retention.

Multiple Releases in a Week:

Normally, the lectures are released once a week. We noticed that there is a peak in the student engagement with the platform as soon as the lectures are released. The students quickly watch the lectures for the week and do not visit the platform till the next release - which is a week away. Sometimes, a week's absence is too long and might result in losing some students. On the other hand, if the lectures are released 2-3 times a week, the student has a reason to come to the platform more often and engage on a more continuous basis.

Students want to participate:

In a normal classroom course, assignments are not always welcome by the student. The fewer the homework tasks and assignments the better. However, in online courses, the students seem to welcome and even ask for problems to work on. There could be multiple reasons for this, but such assignments seem to increase the stickiness of the student to the course and help in increasing the completion numbers.

Mid-course incentives:

In one of the courses, we noticed that the student engagement was dropping and decided to offer some mobile phones as gifts to the top performing students. This seem to galvanise the students: no further drop offs were noted and some of the students who stopped visiting the course came back and completed the course. The gift itself was very small - a feature phone costing US$30, but the prestige of winning a prize is what seem to have mattered.

Conclusions

MOOCs are a powerful tool especially for developing countries to skill at scale and at speed. However, there are several issues in delivering a MOOC especially when the there are bandwidth challenges. The mooKIT has been designed to address these challenges in multiple ways. In this paper we presented how mooKIT solves some of these challenges. Student retention has been flagged as a major problem in MOOCs. We also discussed some techniques the mooKIT course management team has evolved to increase student retention. These have helped in pushing completion rates to as high as 25% in many of the courses.

References

[1] Architecting for the Cloud
https://cse.iitk.ac.in/users/a4c/Arch4Cloud_Brochure.pdf
[2] Sakai Learning Management System https://www.sakaiproject.org/
[3] MOOCs for Development https://www.mooc4dev.org/
[4] Agriculture MOOCshttps://www.agmoocs.in/
[5] IIT Kanpur Outreach Portal http://outreach.iitk.ac.in/
[6] IIT Kanpur Flippedclasses Portal https://onlinecourses.iitk.ac.in/