

# Massive Open Online Courses: Challenges and Opportunities for Education in India

Agughasi Victor Ikechukwu<sup>1</sup> Thampan, A V<sup>2</sup>

<sup>1</sup>Department of Computer Science <sup>2,3</sup>Department of Physics

<sup>1,2,3</sup>St. Joseph's College (Autonomous) Inter-University Centre for Astronomy and Astrophysics (IUCAA), Post Bag 4, Ganeshkhind, Pune

*Abstract*— In the era of technology and globalization, there has been increased access to higher education especially in developed countries and it is expected that as the number of opportunities increases, the tendency for new uncertainties and challenges also increases. In recent years, a simple Google search on MOOCs will return several thousands of links owing to the fact that the concept of online learning has expanded to include a growing number of Massive Open Online Courses (MOOCs). MOOCs, a recent trend in distance learning has swept across Europe and America like an avalanche coupled to the fact that all prestigious universities and reputed institutes across the world are actively involved. Since its inception, there have been web portal (such as edX, Udacity etc) that offer courses for free or with little fee. These courses follow formats that have open ended time schedules and ones that are available for a span of a regular semester. The marvel of this type of instruction is that the course instructors could be tenured professors from prestigious institutions or student turned teachers. This research examines the rise of MOOCs with a review of its history and characteristics. We will describe a MOOC project service attempted by one of the authors and the related observations regarding challenges that are India specific. The paper will examine how MOOCs can enhance accessibility, student engagement, and experiences for lifelong learning. It will also look at how usage of specific technologies, can empower educators and students: we will specifically use examples from Physics education. The authors will also suggest how some applications when embedded into a regular face to face course can increase effectiveness of instructions and how cloud services can enable instructors to reach out to students beyond regular class to increase effectiveness of instructions. Challenges for learners and institutions are examined: for individual instruction, student performance assessment, and long-term administration, and oversight of these types of courses. Findings and suggestions especially in the area of SPOCs (Small Private Online Courses) will also be discussed and recommended where necessary. We will also attempt to showcase a pilot project related to computer intensive educational material in the field of Physics and Computer Science.

**Key words:** MOOC, LMS, E-Learning, Online Learning, Distance Learning, Architecture

## I. INTRODUCTION

Massive Open Online Courses (MOOCs) are either free or paid open online courses offered by some of the world's leading universities and institutions including but not limited to Stanford, Oxford, Harvard, and Massachusetts Institute of Technology (MIT)[6]. It is a gathering of participants, of people willing to jointly exchange knowledge and experiences for each of them to build upon.

A MOOC is by itself a non-defined pedagogical format to organize learning, teaching, training on a specific topic in a more informal collaborative way. It is aimed at unlimited participation and open access via the web. In addition to traditional course materials such as videos, readings, and problem sets, MOOCs provide interactive user forums that help build a community for students, professors, technology experts and teaching assistants (TAs). MOOCs are a recent development in distance education which began to emerge in early 2012.

## II. HISTORY OF MASSIVE OPEN ONLINE COURSES

In the days before the internet, for most people living far away from prestigious institutions, distance education was a way towards getting privileged degrees. With the advent of internet, however, the distances decreased and there arose a possibility of getting education over broadband internet. One option of specialized training in courses not available in the neighborhood college/university is, these days, achieved by MOOCs. The term MOOC traces its history [1] to Bryan Alexander and Dave Cormier for their course Connectivism and Connective Knowledge (CCK08) in 2008 that was provided free and also with the option of having a certificate for a fee - entirely over the internet. Early MOOCs were launched by prestigious universities like Stanford, MIT and Caltech. By 2012, this in turn spawned third party aggregating providers or platforms of online courses like ALISON, Udacity, Coursera and edX. At present there are more that 900 MOOCs offered by US universities and colleges over these diverse platforms alone [2]. The current trend in North America is for universities collaborating together to provide rich and diverse courses. In Europe and the other continents too, the trend for large courses has caught on and is driving a rich and unique trend in distance learning. The Indian government has launched an India specific MOOC platform called SWAYAM using the OpenEdx platform [3].

## III. PIONEERS OF MOOC

The early inventors of MOOCs are two Canadian researchers: George Siemens and Stephen Downes. George Siemens is a writer, theorist, speaker, and researcher on learning, networks, technology, analytics and visualization, openness, and organizational effectiveness in digital environments. He is the originator of Connectivism theory and author of the article Connectivism: A Learning Theory for the Digital Age and the book Knowing Knowledge - an exploration of the impact of the changed context and characteristics of knowledge. Stephen Downes works for the National Research Council of Canada where he has served as a Senior Researcher, based in Moncton, New Brunswick, since 2001. Affiliated with the Learning and Collaborative Technologies Group, Institute for Information Technology,

Downes specializes in the fields of online learning, new media, pedagogy and philosophy. Downes is perhaps best known for his daily newsletter, OLDaily, which is distributed by web, email and RSS to thousands of subscribers around the world, and as the originator of the Massive Open Online Course (MOOC). He is a popular speaker, appearing at hundreds of events around the world over the last fifteen years. He has published hundreds of articles both online and in print through two decades of research and development into learning networks and related technologies.

#### IV. CHARACTERISTICS OF MOOCS

Key characteristics of Massive Open Online Courses are: scalability, massiveness, openness, and a connectivist philosophy. McAuley, Stewart, Siemens, and Cormier (2010) [6] explained that MOOCs use strategies similar to social networking to connect the masses but with the added benefits of subject matter experts to facilitate the content and to coordinate a vast array of free, online materials Xin et al (2013) [6]. Individual learners from across the world can actively interact with other sub-groups of similar interest through discussion boards.

- 1) Massiveness: The number of people enrolled in a course is very large. For instance, the Artificial Intelligence course developed and conducted by Stanford faculty Sebastian Thrun and Peter Norvig is an example of massiveness as more than 160,000 enrolled in the course Martin (2012) [7].
- 2) Openness: Openness involves several key concepts: software, registration, curriculum, and assessment; communication including interaction, collaboration, and sharing; and learning environments Rodriguez (2012) [8]. Rodriguez (2012) [8] further discussed that the software used is open-source, registration is open to anyone, and the curriculum is open (perhaps loosely structured and it can even change as the course evolves), the sources of information are open, the assessment processes (if they exist) are open, and the learners are open to a range of different learning environments. Furthermore, McAuley et al. (2010) reinforced that openness entails that any learner can take a MOOC and, as a result, exclusion from higher education opportunities is not compulsory [8].
- 3) Connectivism: MOOCs offer an emerging online teaching methodology inspired by a connectivist philosophy. It includes teaching strategies that allow an instructor to assume the role of facilitator with learners actively interacting with other students. It is not a knowledge transfer from instructor to learner in a single learning environment (Kop, 2011) [9]. Connectivism values autonomy, diversity, openness, and interactivity (Rodriguez, 2012) [8].

#### V. ADVANTAGES AND DISADVANTAGES OF MOOC

##### A. Advantages

As with every adventure in life, there are two sides to the coin. Importantly, MOOCs have been beneficial in the following areas; accessibility of courseware's, increased potential for student engagement, and expanded lifelong learning opportunities [6].

- 1) Accessibility - Accessibility is a key factor in distance learning and MOOCs promises free accessibilities to learners as well as instructors. Vast array of information is accessible to any learner with basic computing knowledge and the best part is there is no prerequisite training prior enrolment. Leber (2013) stated that, "as online education platforms like Coursera, edX, and Udacity burst onto the scene over the past year, backers have talked up their potential to democratize higher education in the countries that have had the least access". In addition, MOOCs have not been limited to college students, and/or professionals, but even younger students can participate in the MOOC experience[10].
- 2) Student Engagement - According to Trowler (2010), student engagement is the investment of time, effort, and other relevant resources by both students and their institutions intended to optimize the student experience and enhance the learning outcomes and development of students, and the performance and reputation of the institution. Student and instructor participation, motivation, instructional method, and delivery are all important aspects necessary to create a MOOC environment conducive to learning. For a student to be engaged in a particular course of interest, there should be mutual understanding of the responsibilities of both the learner and the instructor so as to enable the learner to strive and complete the course.
- 3) Lifelong Learning Experiences - As it is rightly said "education is for life, not for school", the experiences we gain while gain while studying especially management courses enables us to be good managers as most of the courses are practically oriented. According to Inge deWaard (2011), "lifelong learning skills will be improved, for participating in a MOOC forces you to think about your own learning and knowledge absorption". MOOCs allow participants to pursue a particular interest or to continue their professional development [12].

##### B. Disadvantages

There are numerous disadvantages associated with the influx of MOOCs. The notable ones are listed below.

- 1) Official recognition - The major drawback of MOOCs is the lack of official recognition by the qualifying university and industry. The courses completed do not feed into a degree or other qualification, but are self-contained. The recent trend is that some institutions and learning platforms are gradually introducing the concept of nanodegree (like Coursera) where students pursue industry-relevant project and earn recognition certificate(s) upon course completion.
- 2) Completion inability - A recent study shows that only 100 out of the 10000 students, who enrolled in one MOOC, completed it. This is a major disadvantage as most people tend to abandon the courses enrolled for because of lack of mentorship. Students especially lower school students prefer someone to always encourage them to do their assignment and homework which is almost impossible with MOOCs.
- 3) Cultural diversity - It is always said that "charity begins at home", this holds true for most of us in India.

On a large scale, the syllabus of courses offered by a university outside India may not match our culture and other conditions we are familiar with. For example, if you are enrolled in a course about religion and language from a university in the United States, you will find out that different castes and languages exist in India that never existed in the states.

VI. A PILOT PROJECT POST GRADUATE PHYSICS, PHYSICS DEPARTMENT, ST. JOSEPH'S COLLEGE

We outline here a pilot project initiated in the Department of Physics. The online components have two parts to it by using Google Apps and using Moodle, a Learning Management System (deployed internally). One crucial consideration when initiating a new facility is its cost effectiveness in a cash-strapped system. Both Google Apps and Moodle are free services (with optional paid components - but no paid components were opted for). With a free service come its own complexities of setting up and deployment. We shall outline the steps taken to automate the system and the benefits that ensue. The most important feature in Google apps are its collaborative editing capabilities which enable both the teachers and students to work together, facilitating effective learning techniques. The most distinguishing feature of both these apps are that there is no specific intended way to use either; this means that the possibilities are endless.

Google Apps - The cloudification of a regular physical course has multiple advantages. The first one is increased approachability and availability of the instructor. The second being quick disbursement of critical information and the distribution of study material. In addition to these, the system handling the grading eases the work of the instructor providing more time to making the course productive. Downtimes due to network outage are a limitation and, therefore, a disadvantage. But, clearly, taking adequate steps to reduce network outage is of key importance. We use two types of apps: external and internal. The apps that we use are the following; described also, are the uses we put them to.

The three main external apps that we use are Google+, Google Calendar and Google Drive.

Google+ - We use Google+ mainly to disburse different types of information; via status updates and hangouts. The functions that it has been put through are the following:

- Google circle: Virtual Classroom
- Study Material (Fig. 1)
- Scientific Information/News (Fig. 2)
- Announcements (Fig. 3)
- Job Postings (Fig. 4)
- Discussion Forum (Fig. 5)
- Chat

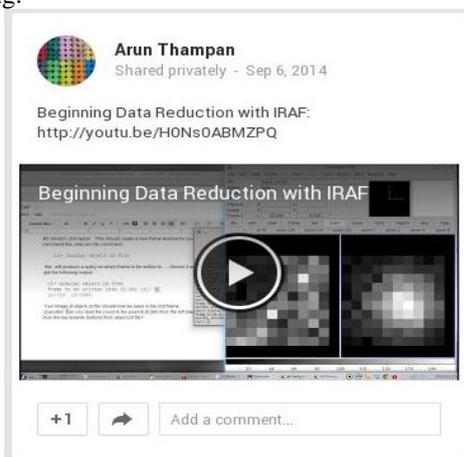


Fig. 1: Study Material

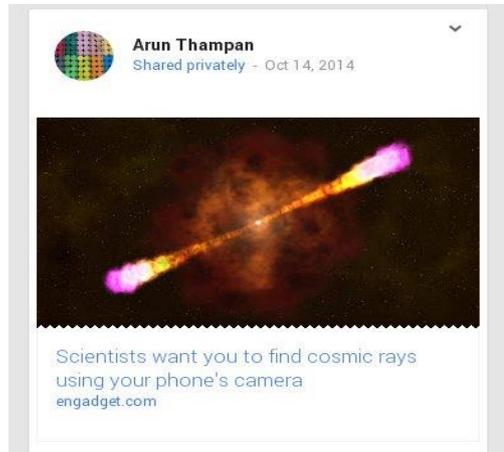


Fig. 2: Scientific Information/News



Fig. 3: Announcements

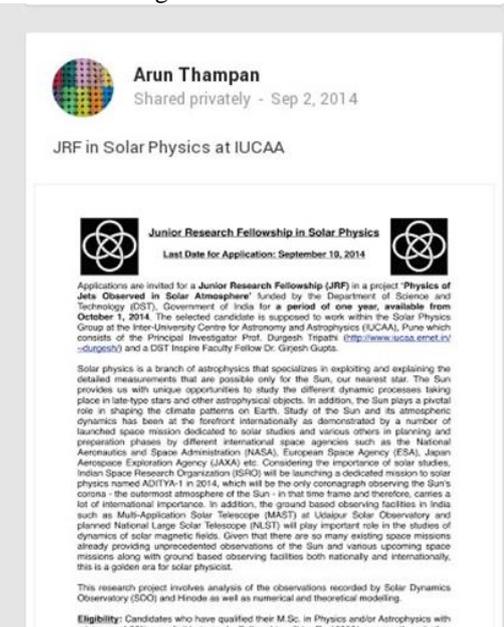


Fig. 4: Job Postings

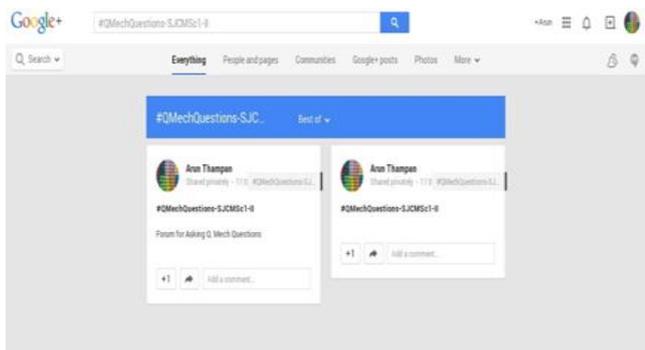


Fig. 5: Discussion Forum



Fig. 6: Google Calendar as Time Table

Google Calendar - Lesson plans are distributed to the students through Google Calendar. Each calendar, for a specific class is shared with the appropriate members of the class (including other teachers). This provides a daily record of activities for retrospection.

Google Drive - Study materials and presentations are provided to the classes through Google Drive. In addition to having folders for students, less critical material belonging to the department are also placed on the drive and shared amongst the staff.

Students having smart phones usually get the material early enough and co-operate by spreading the information to those who don't have smart phones. All of them access the material through the computers in the laboratory.

Moodle - We have set up a Small Private Online Course within the Physics Department. The SPOC is set up over a Learning Management System (LMS) called Moodle [14]. Moodle is an open source, community driven LMS with many plugins that enhance its performance and add utilities. The server setup requires some amount of expertise (it runs on an Apache webserver, with PHP as the program base and MySQL as the database) but it has a vibrant community to support and help new users and there exists a lot of documentation that make maintaining the system easy. In Oct 2014, the Physics Department initiated a pilot project of having one P.G. Physics computer intensive course (Astrophysics Laboratory) on the LMS. The steps involved adding the students to the database and enrolling them into the course. The weekly activity consisted of entering attendance, a quiz whose grades went into grades for the continuous internal assessment and the resources such as notes and video files in google drive mirrored here. The LMS had a way of also embedding external applications for learning astrophysics. In 2014, the Astrophysics Laboratory (2013) had an enrollment of 20 students.

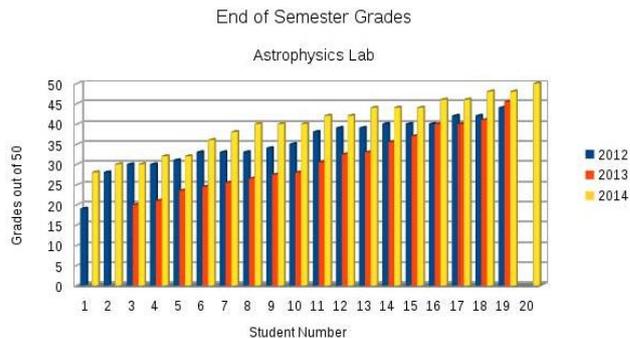


Fig. 7: Introduction of Learning Management System in 2014

Fig. 7 shows a plot of the Student Grades for the Astrophysics Laboratory course for 3 years: 2012, 2013, 2014. Although it is only one year worth of data, the apparent trend shows a decreased gradient in student performance and a clear up-liftment of the median performance. The success led us to continue the course for 2015 and also add a new (also computer intensive) course to the list (C-programming Laboratory). The current courses contain a total of 43 students (21 for Astrophysics Laboratory 2014 and 22 for C-Programming Laboratory)

Some of the advantages of using the LMS is of reducing human errors and human bias in grading. It appears to increase the overall student satisfaction at the end of the course.

## VII. CONCLUSION AND RECOMMENDATION

According to the research carried out by the authors in some selected colleges in India, little has been heard of Massive Open Online Courses (MOOCs), rather prestigious colleges have embraced the Small Private Online Courses (SPOCs) because of the limitations faced by MOOCs (already discussed). This lateral shift has been welcomed and implemented in the department of Physics (St. Joseph's College, Bangalore), although it is being experimented, it is recommended that most universities embrace this welcome development of having a domain-based SPOCs suited for their students.

## REFERENCES

- [1] <http://moocguide.wikispaces.com/1.+History+of+MOOC%27s>
- [2] [http://en.wikipedia.org/wiki/List\\_of\\_MOOCs\\_offered\\_by\\_US\\_universities](http://en.wikipedia.org/wiki/List_of_MOOCs_offered_by_US_universities)
- [3] <https://www.class-central.com/report/swayam-india/>
- [4] <http://moocguide.wikispaces.com/2.+Benefits+and+challenges+of+a+MOOC>
- [5] <http://bloguk.jobandtalent.com/moocs-advantages-and-disadvantages/>
- [6] McAuley, Stewart, Siemens and Cormier (2010): The MOOC Model for Digital Practice retrieved from [www.elearnspace.org/Articles/MOOC\\_Final.pdf](http://www.elearnspace.org/Articles/MOOC_Final.pdf)
- [7] Xin Chen, et al (2013): Fad or Future: The Advantages and Challenges of Massive Open Online Courses (MOOCs)
- [8] Martin, F. G. (2012): Will massive open online courses change how we teach? Communications of the ACM, 55(8), 26-28. doi: 10.1145/2240236.2240246

- [9] Rodriguez, C. O. (2012): MOOCs and the AI-Stanford like courses: Two successful and distinct course formats for massive open online courses. *European Journal of Open, Distance and E-Learning*. Retrieved from <http://www.eric.ed.gov/PDFS/EJ982976.pdf>
- [10] Kop, R. (2011): The challenges to Connectivist learning on open online networks: Learning experience during a massive open online course. *International Review of Research in Open and Distance learning*, 12(3), 19-37.
- [11] Leber, J. (2013, March 15). In the developing world, MOOCs start to get real. *MIT Technology Review*. Retrieved from <http://www.technologyreview.com/news/512256/in-the-developing-world-moocs-start-to-get-real/>
- [12] Trowler, V. & Trowler, P. (2010). Student engagement executive summary. The Higher Education Academy. Retrieved from [http://eprints.lancs.ac.uk/61684/1/Student\\_Engagement\\_Project\\_Executive\\_Summary.\\_Nov\\_2010.pdf](http://eprints.lancs.ac.uk/61684/1/Student_Engagement_Project_Executive_Summary._Nov_2010.pdf)
- [13] Inge deWaard te al (Nov. 2011) :Using mLearning and MOOCs to Understand Chaos, Emergence, and Complexity in Education retrieved from <http://www.irrodl.org/index.php/irrodl/article/view/1046/2026>
- [14] <https://moodle.org/>

