MOOC on Integrated Pest Management (IPM): A New Online Venture in Agricultural Education System

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Abstract

A massive open online course (MOOC) is an online course aimed at unlimited participation and open access via the web. In India, MOOCs in engineering and basic sciences are being successfully developed and offered by national institutes like IITs and IISC under the NPTEL programme funded by MHRD. There are very few MOOCs that are in the sector of agricultural education, whether in India or globally. Considering the huge potential and popularity gained by the MOOCs, an attempt was made in developing MOOCs in agriculture in collaboration with IITK (http://www.agmoocs.in/) during 2016. The response was overwhelming. MOOC on "Integrated Pest Management (IPM)" was designed and offered by UASR (http://www.agmoocs.in/ipm/). It was an eight week course (Jan.11 to March 11 2016) offered online on the platform (MOOKIT) developed by IITK targeting students and faculty of State Agriculture Universities (SAUs) across India. Over 2800 students, faculty, extension professionals and research scientists had registered the course. Attendance, views on the video lectures, participation in the general/subject forums were monitored online. The course consisted of series of video lectures released at the rate of 5-6 per week along with respective lecture notes and PPTs. The performance of participants was assessed through two quizzes and an assignment released online during the course period. Participants who have scored more than 7.00 points out of 10.00 were awarded performance certificate. Of the total registrations, 19% of the participants could obtain performance certificate which is higher than average compared to MOOCs offered in other fields. A survey of learners at the close of the MOOC showed that over 65% participants rated as high the quality of course material, relevance of quizzes/assignment, ease of learning and knowledge of instructors in the subject. Over 42% participants opined that, more and more such courses in agriculture should be launched which benefits diverse student and faculty community. In our paper, detailed information about the course design and the pedagogy will be given. We will also present data from the learning analytics to demonstrate how the faculty adjusted the topics and schedules dynamically in response to data available in the course space.

Introduction

A massive open online course (MOOC) is a disruptive innovation resulting from the convergence of distance education (DE) – with its well-established processes for curriculum development and assessment and accreditation, and e-learning which offers anytime learning opportunities with a defined pedagogy. MOOCs provide greater levels of interaction with much higher levels of participation than either conventional DE or current practices in e-learning. In addition to traditional course materials such as filmed lectures, readings, and problem sets, many MOOCs provide

interactive user forums to support community interactions among students, professors, and teaching assistants. It enables closer network of students, allows exchange of ideas, clarify doubts and express their opinions. MOOCs also allow online evaluation of participants through quizzes and assignments. MOOCs are a recent and widely researched development in distance education which were first introduced in 2008 and emerged as a popular mode of learning in 2012 (Pappano, 2014 and Lewin, 2013).

Learning outcomes in India's educational institutions are poor due to variable quality of teaching, and vocational training capacity is not adequate for the growing workforce. Technology applications can improve the quality of teaching and raise vocational attainment. Blended learning with MOOCs can bring high-quality courses to students. In India, MOOCs are being successfully developed and offered in the field of engineering and basic science by national premium institutes like IITs and IISC under the NPTEL (National Programme on Technology Enhanced Learning) programme funded by MHRD (Ministry of Human Resource and Development). More than 350 courses are so far offered in above fields successfully (http://freevideolectures.com/blog/2010/11/130-nptel-iit-online-courses/).

India's agriculture sector has made strides since the Green Revolution but still has immense potential to raise farm productivity and farm income. Given the diversity of Indian agriculture, the demographic profile of our population and more importantly, the scale at which it is required, the conventional methods of capacity building will be of little use. Information and Communication Technologies (ICT), that are playing an important role in bridging the digital divide, could successfully be deployed for this purpose. Online learning is a practice of linking learners, learning materials and mentors/teachers using technology mediation (especially, the Web and social networking). MOOC are the recent disruptive innovations that can enable a small group of teachers/mentors to offer learning services to many people in the duration of a single course. India can possibly emerge as a pioneer in designing and offering MOOC for competency development in agriculture. IIT-Kanpur (IITK) and Commonwealth of Learning (COL) have jointly delivered a MOOC on mobiles on topics covering agricultural extension, rural finance and education that attracted learners from 116 countries. Certificates of completion and competence were awarded by IITK Centre for Continuing Education. Looking into the huge potential and popularity gained by these, efforts were made in developing MOOCs in few subjects in agriculture (http://www.agmoocs.in/) during 2016 and found huge response. Five courses *viz*., Integrated Pest Management (IPM), Nutrition, Therapeutics and Health, GIS in Ag-essentials and applications, Weather forecast in Agriculture and Agro-advisory and ICT – basics were offered on the platform (MOOKIT) developed by IIT Kanpur by different State Agriculture Universities. Over 15,000 students (both UG and PG of several SAUs) and faculty have registered and nearly 20 % of the registered students successfully completed and obtained certificates. The present paper describes the details of pedagogy, methodology, feedback analysis carried out on one of the courses, Integrated Pest Management (http://www.agmoocs.in/ipm/) offered by us (faculty of University of Agricultural Sciences, Raichur).

The Study

The course

Insect pests cause huge economic loss to crops across the globe affecting total food production which is essential to meet the demands of growing human population. Avoiding such loss is of the immediate concern for all and this is achievable through Integrated Pest Management (IPM). IPM system mainly aims at utilizing economic and eco-friendly techniques of management in a compatible manner in order to maintain the pest population at levels below those causing injury / damage. The course basically aimed at bringing together well-established principles and practices of IPM, recently evolved good practices of pest management in different components of IPM, highlighting successful IPM case studies on important crops in the sphere of online learning (especially pedagogy and quality assurance) and learning outcome evaluation.

The course was designed for students pursuing their graduation in agriculture in various state and central agricultural universities (SAU/CAU) compatible with the principles laid down in the ICAR Fifth Deans' Committee Report (2016). It was also supplementary to existing academic programmes and is not meant to substitute or replace any of the existing courses. The course also suits to the students of post graduation in plant protection division, young faculty/researchers/extension personnel working in various ICAR (Indian Council for Agricultural Research), SAU, government and non government agriculture departments and educated farming community.

The course material was prepared by combining key components of sound online pedagogy *viz*., controlled length of videos, statement of expected learning outcomes in every unit/lesson, summaries at frequent intervals, assignment of activities at regular intervals etc., During the course, careful and systematic mentoring of learners in online communities, systematic and rigorous adherence to quality assurance considerations and well established practices in the conduct of invigilated online examinations that are essential in quality assured certification were maintained.

The duration of the course was 8 weeks starting from 11th Jan.2016 and ending on 14th March 2016. The course content was divided into eight sections covering basic principles and applied aspects of IPM. In total 47 video lectures were delivered during the course period stretching to 575.40 minutes. The duration of each video lecture ranged from 6.28 min. to 18.46 min. Most of the video lectures accompanied respective power point presentations and lecture notes and were freely available for downloads. A customised evaluation methodology was developed in the form of quizzes and assignment in order to assess the effectiveness of the learning process. A total of four quizzes each comprising 20 questions were released at the end of every two weeks, whereas, one assignment was released at the end of 6th week. Quizzes and assignment were evaluated on the basis of 10.00 point grade scale and participant who has secured 7.0 or more points was given performance certificate.

As it was an open course, there was no prior learning required. However, certificates of participation required participants to meet strict eligibility criteria that are fully quantified. It can therefore be expected that certificates were received mainly by those who already have a degree or are enrolled in a degree or an equivalent professional practice.

Two months before the launch of the course, a wide publicity in the form of brochure was given to all the ICAR and SAUs. The content of the brochure was also displayed on the NPTEL, IITK and UASR websites well in advance to attract large learning community. Apart from this, an introductory video clip by the course teachers on the course, its content, benefits, mode of evaluation and instructions for registration was launched two weeks before the start of the course. Contact details of the instructor-in-charge of the course and admin group was given in the publicity documents/video clips to enable the interested learners to seek the admission process. The course was offered free of cost without involving any registration fee.

The Platform

The MOOC on IPM was offered on a lightweight MOOC management platform called MOOKIT which was conceived, designed and developed by IIT, Kanpur (http://www.mookit.co/). The platform consisted of two essential components - (i) Simple Learning Management System (LMS): A learners' (students') platform which facilitates online learning and community interaction, armed with the tools to assess a student's learning at some level (ii) Course Studio: An instructor's course creation platform (a studio) through which an instructor can create and fully manage an online course.

The LMS provided hassle free learners' platform. It consisted of online learning facility such as accessing lecture videos, lecture notes and PPTs in *Resource* category and community interactions either in general or on specific topics with peers groups as well as course instructors in the form of *Forums* and *Hangouts*. The announcement section provided latest instructions/announcement for the learners'. Course instructors were made to be in touch with learners' in attending their queries continuously through general and subject forums. Twice during the course

period, once in the second week and sixth week, course instructors and admin groups had real time interaction (video/audio meetings) with learners to attend the subject and system related issues through *hangouts*.

To record the video lectures of the course, a well established course studio built in IIT, Kanpur was utilized. A hands-on training on how to prepare a course material for MOOC and how to present a topic in the form of video lecture was provided by experienced MOOC instructors of IITK in two workshops conducted in their campus.

The identity management and authentication systems hosted on servers located in India (NPTEL servers or IITK servers) to safeguard the privacy and personal information of the learners. Finally, the platform transform to a futuristic course management system with multiple components like dedicated assignment grading mechanisms, interactive browser based learning tools (like virtual labs, online programmer, peer reviewer etc.) to support the needs of not only the agricultural sciences courses but also the courses from other professional and non-professional streams.

Impact Analysis and Evaluation

Assessment of the effectiveness of the course IPM, in general, is an emergent area of research. It was measured in terms of its effectiveness as e-learning courses, for which established rubrics of measurement exist. A questionnaire was sent via electronic mail to all the users of IPM on 15th March 2016 after the completion of the course. The responses were grouped into Part A and Part B. Part A feedback consists of personal information, platform and course feedback. It summarises all the responses of each multiple choice/rating question in graphical form through Google analytics and Part B consists of the responses of all open questions. The number of respondents in Part A varied from 922 to 1170, whereas, in Part B it was from 234 to 490.

Findings

MOOC on IPM registered 2968 learners in its course period. Around 97% of the total learners were from India whereas, remaining 3% belong to 43 other countries. Around 63% of the users came to know about the course through their friends followed by 22% through ICAR website and remaining through advertisements in form of brochures, newsletters and social media (Fig. 1). Majority of the users were males (69%) followed by females (Fig. 2). Highest numbers of users were in the age group of 25-34 years indicating the educational status as post graduate or professional workers. Closely followed is the age group of 17-24 years indicating the undergraduate students of SAUs. Around 13% belonged to the age group of 35-44 years (Fig. 3).

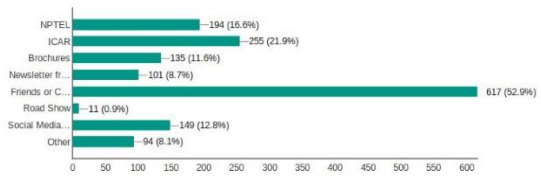

Fig. 1: Mode of awareness about the course

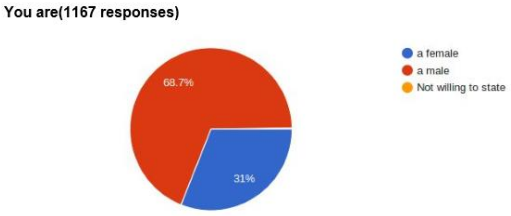

Fig. 2: Gender status learners' group

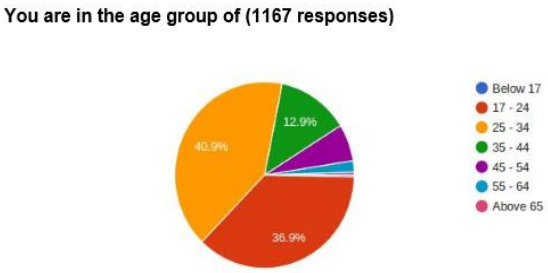

Fig. 3: Participants classified into different age groups

Majority of users belonged to 'student' category (61%) and around 15% belonged to 'faculty' followed by 8% to 'extension professionals' (Fig. 4). Nearly 69% of the users were from agricultural universities (Fig. 5). Most of the users indicated that, they accessed the course either from home (49%), office (39%) or public places (22%) (Fig. 6).

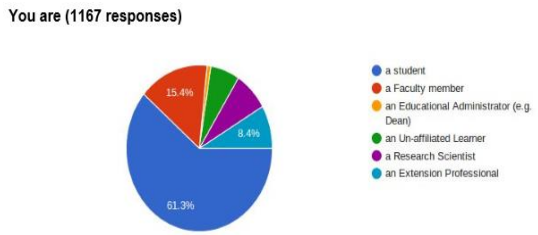

Fig. 4: The pie chart depicting the learners' profession

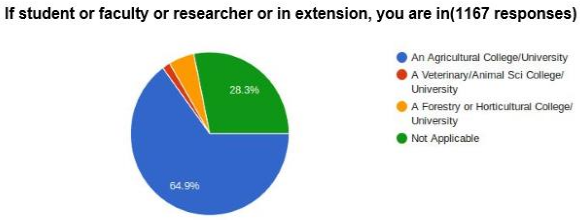

Fig. 5: Institution details where the learners' belong

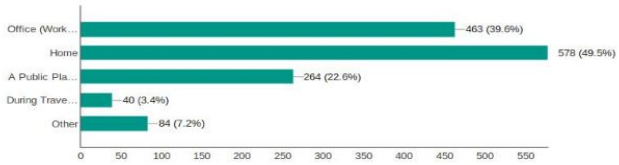

Fig. 6: Graph depicting the places where course was accessed

Highest number of users (86%) accessed the course '*To increase their knowledge and awareness about the subject*', followed by '*for professional development*', '*curiosity*' and '*to get a certificate*' (Fig. 7). Majority of the users (54%) opined that, they would be using this knowledge gained in 'sharing with friends and colleagues', whereas, others, expressed to share this knowledge with students (20%) and project team members (8.6%). A small section of the users also expressed to use this experience in designing their own course (Fig. 8).

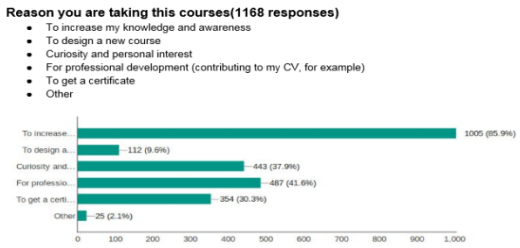

Fig. 7: The graph depicting the reasons for taking the course

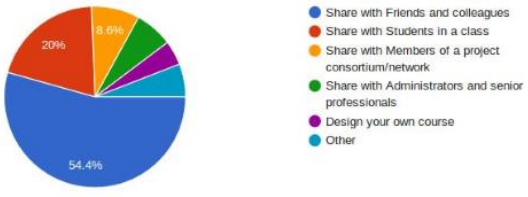

Fig. 8: Response of learners on how the knowledge gained will be used in future.

Feedback related to the IPM course was obtained from 823 users. More than 50% of the users expressed satisfaction over the good quality course material used, the pace at which course was conducted, knowledge of instructors about the subject, and the relevance of the content. As a result more than 70% of the users opined that, they would have taken this course even if no certificate was offered. Overall satisfaction was expressed by many users on the relevance of quizzes and assignment and even demanded more of such evaluation schemes to be introduced. More than 90% of users desired to recommend this course to others (Fig. 9).

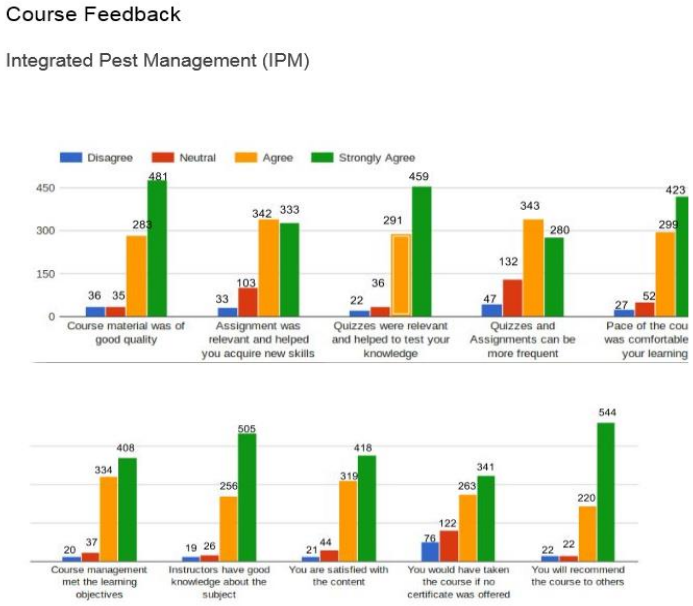

Fig. 9: Response by learners' on various questions raised on the course curriculum

The feedback on the performance of platform is worth mentioning. The MOOKIT platform gained an average rating of 4.3 and 4.4 out of 5.0 in terms of easy to navigate and easy to access category, respectively (Fig. 10 a&b). Users were observed to access the course content via video lectures (74%), PDFs (87%), audio (23% as well as phone calls (8%) (Fig. 11).

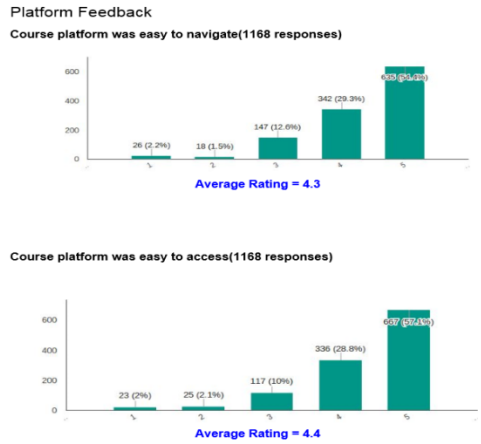

Fig. 10. The graph representing the ease of (a)navigation and (b) access to the platform by users

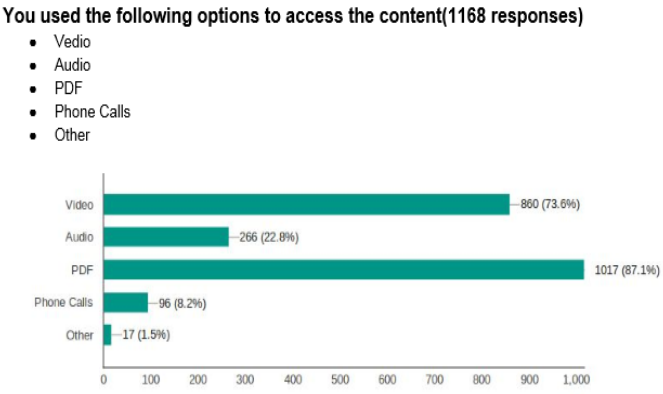

Fig. 11. Per cent users accessing the course content through different modes

Of the 2963 registered users for IPM course, 563 users successfully completed the course by fulfilling all the criteria such as near complete attendance, regular online interaction with peer group and course teacher on the subject, and successful completion of quizzes and assignment on time.

Conclusions

The landscape of agriculture is changing rapidly due to include agribusiness in supply-chain operations and management. As a result, there is an absolute necessity to empower farmers, women and youth in terms of livelihood and entrepreneurship skills. Innovations in ICT which are playing an important role in bridging the gap could be successfully employed for this purpose. Looking into its importance National Academy of Agricultural Science (NAAS), New Delhi has brought out a policy paper on 'MOOC for capacity building in Indian agriculture: Opportunities and challenges' in January 2015 (ICAR, 2015). The policy paper emphasises the strength and potential of MOOC in reaching out larger section of the students/faculty/extension personnel in delivering the goods. Encouraged by the policy decision, MOOCs in some of the agricultural subjects were designed and offered in collaboration with NPTEL and IITK of which, IPM was one among them.

The course content taken care of inclusion of latest and modern practices employed in IPM of various crops. The users during the interaction with instructors and other learners expressed the satisfaction over gaining additional knowledge through this course. This has been expressed in the form of willingness to take the course even if no certificate was give. Further, the expression of learners in using this content to teach their students and developing their own course is a testimony on the novelty of this course. The course, apart from helping the user in gaining knowledge and confidence, has provided perfect platform to bring large group of students to learn and interact. Along with them, good number of faculty, researchers and professional extension personnel were also brought together. This course has provided good access to the knowledge, instructors, experts and peer groups.

The MOOKIT platform on which the course was offered gave a wide and easy access to the course content to the learners. The analytics in terms of ease of access and navigation of the platform indicates the comfort expressed by the users. Further, the platform provided a wide opportunity not only in the form of videos and PDFs lectures, but also through audio and phone calls which enabled maximum support to the learners. Majority of users accessing video lectures directly from the platform itself indicated the stability of the system to support wide viewers.

References

1. Pappano, Laura (2014). *The year of the MOOC*. Retrieved from http://www.nytimes.com/2012/11/04/education/edlife/massive-open-online-courses-are-multiplying-at-a-rapid-pace.html?pagewanted=all&_r=1.
2. Lewin Tamar (2013). *Universities Abroad Join Partnerships on the Web*. Retrieved from http://www.nytimes.com/2013/02/21/education/universities-abroad-join-mooc-course-projects.html.
3. Indian Council for Agricultural Research. (2016). 5th Dean committee report [in publication].
4. Indian Council for Agricultural Research. (2015). MOOC for capacity building in Indian agriculture, Policy paper 70: pp 1-27.
5. National Programme on Technology Enhanced Learning (2016). Retrieved from http://freevideolectures.com/blog/2010/11/130-nptel-iit-online-courses/
6. Indian Institute of Technology, Kanpur (2016). MOOC on IPM. Retrieved from http://www.agmoocs.in/ipm/
7. Indian Institute of Technology, Kanpur (2016). MOOCs agriculture. Retrieved from http://www.agmoocs.in/